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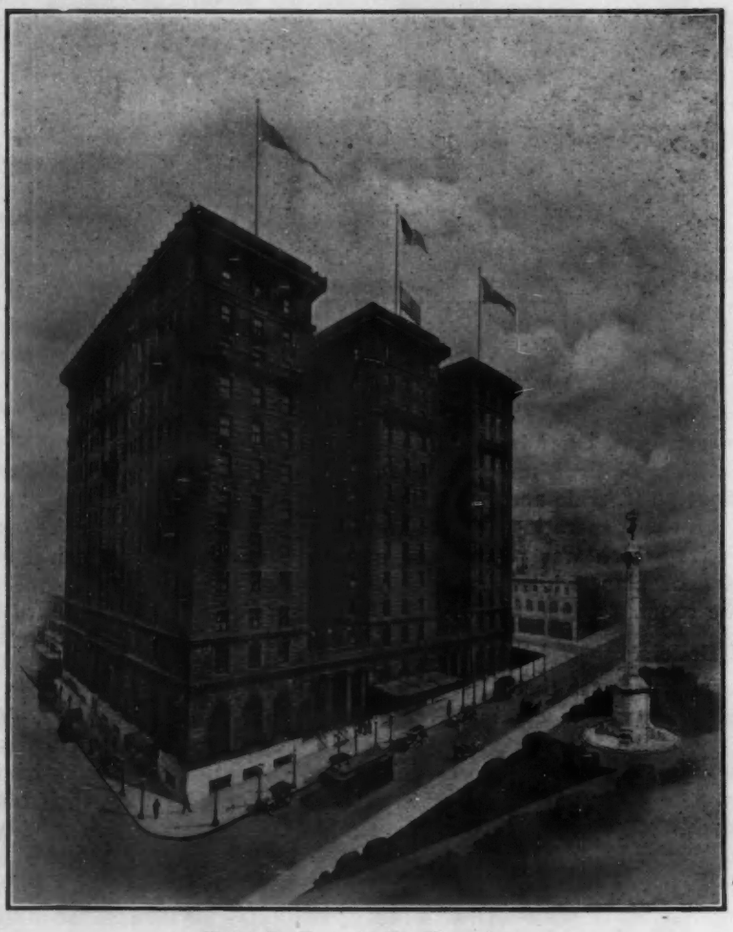
ELECTRICAL EQUIPMENT OF HOTEL ST. FRANCIS

BY G. A. SCHNEIDER

Not least of the factors which contribute to San Francisco's reputation for hospitality are its numerous hotels, of which the St. Francis is the largest and perhaps the most completely equipped with those appointments which promote the comfort of its guests. Facing the beautiful Union Square, which is the theatre for the principal events of all the famous festivals of San Francisco, this hotel occupies a most appropriate position for an institution of its kind.

The Hotel St. Francis stands on the northwest corner of Geary and Powell streets, in the heart of the fashionable theatres, clubs and shops of the city. From an architectural point of view it adds much to the ever increasing number of magnificent buildings in this vicinity.

It is thirteen stories in height above the street level, with one story below and contains 720 guest rooms, not including the recently completed annex on the Geary street side. Another annex to be built just north of the present structure will bring the total of rooms to 1046 and give a capacity about equal to any hotel in existence.



Hotel St. Francis, San Francisco.

The exterior of the building is gracefully proportioned and is finished in such a manner as to be especially pleasing. The interior finishing and furnishing are in keeping with the beautiful exterior and from an engineering standpoint, the heating, lighting and numerous power applications are in accordance with the most modern practice.

When originally constructed the hotel was provided with a power equipment suitable for all service other than furnishing the electrical energy required. In the spring of 1909, the management considered the installation of its own electric plant and after careful investigation the advantages to be derived therefrom secured its adoption. The plant now completed has a total capacity of 825 kilo-watts.

Due to the limited amount of space available for this new equipment, the arrangement is not as good as it might be under more favorable conditions. This, however, does not detract from the high quality of the apparatus and the careful and thorough manner in which it has been installed. The plant can, therefore, be expected to give good results and should prove an excellent investment.

The new boiler and engine room is placed under

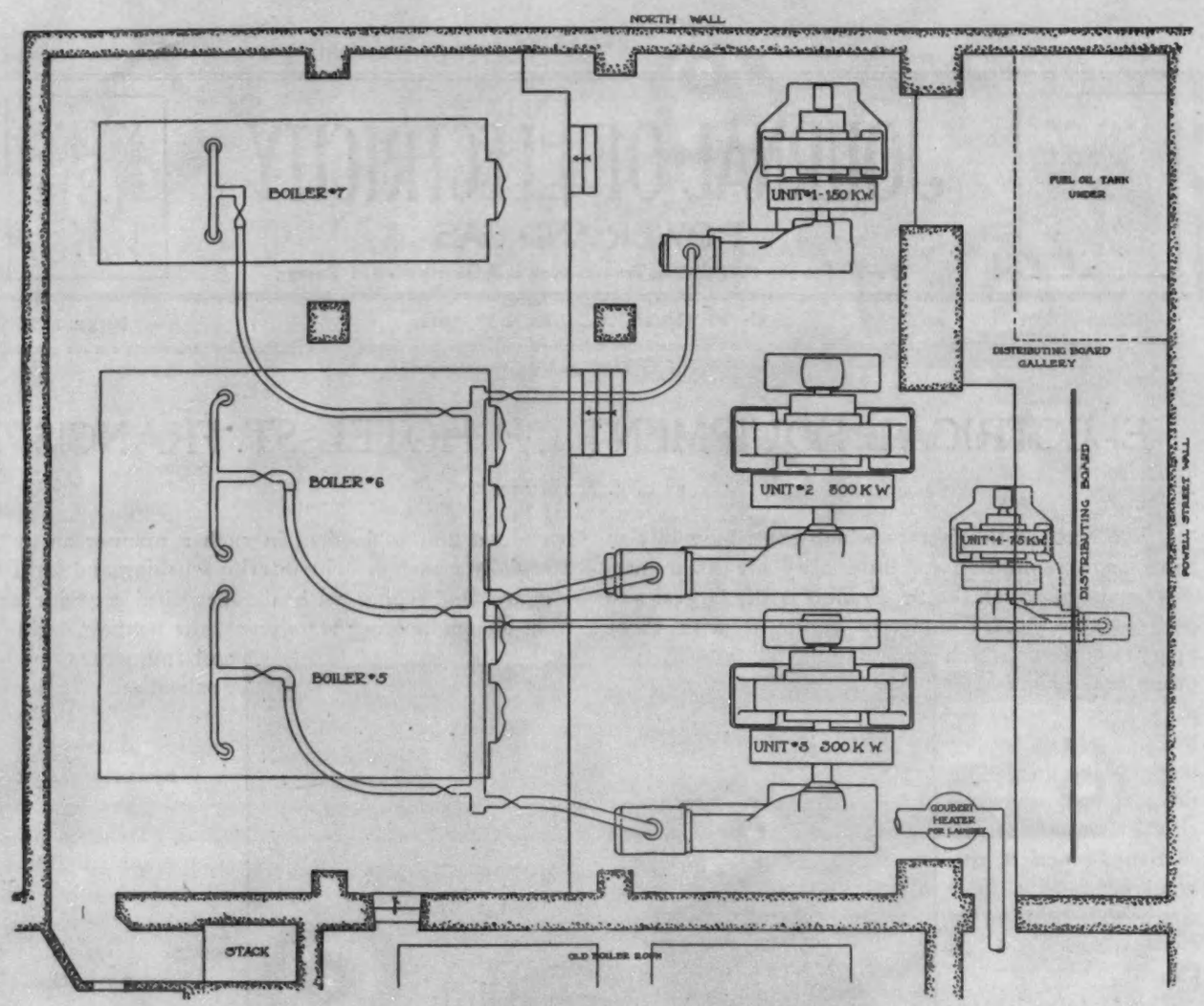


Fig. 1. General Plan of Engine and Boiler Room.

the north wing of the hotel and extends beyond the Powell street wall, a distance of 12 ft. under the sidewalk. The room is about 50 ft. wide and 67 ft. deep. The relative position of the generating units and boilers is shown in Fig. 1 which was reproduced in part from the original floor plan, while Fig. 2 illustrates one corner of the room.

Boilers.

The boiler equipment comprises three Babcock & Wilcox water-tube boilers, having a combined capacity of 858 h.p.—with two boilers set in one bank and the other singly. The boilers are set on a level about 4 ft. below the engine floor to allow sufficient head room. Each boiler is provided with a Little Giant oil burner, California crude oil being used entirely for fuel. Suitable oil and steam supply pipes from pumps in the old boiler room (to be described later) are brought to these burners, all of which are controlled by valves conveniently placed. Steam is maintained at 140 lb. per square in.

The stack extends up through the center of the building 25 ft. above the roof. It is about 6 ft. in diameter and is connected to the boilers by breeching extending along the rear wall.

Oil for the boilers is stored in two tanks, each holding 8000 gallons. One of these is under the floor of the new engine room and the other under the old boiler room. The entire supply is delivered into the first tank from which it is pumped into the second tank as used. This scheme of handling was devised to overcome the necessity of having tank wagons stop directly in front of the hotel main entrance to deliver oil.

Piping.

The steam piping consists of a 10-in. main header placed just over the front of the boilers, to which lines are connected from each boiler. These connections make a ninety degree bend and are placed in a horizontal position. From this steam-header connections are made to each engine. There is also a connection leading to the old boiler room enabling all boilers to work in parallel.

Each engine has a separate steam separator mounted just over the throttle valve and each separator is individually connected to a Denny steam trap. The steam lines from separators to trap are kept open at all times, thus insuring dry steam at the throttle. A trap of the same type is also supplied for the main

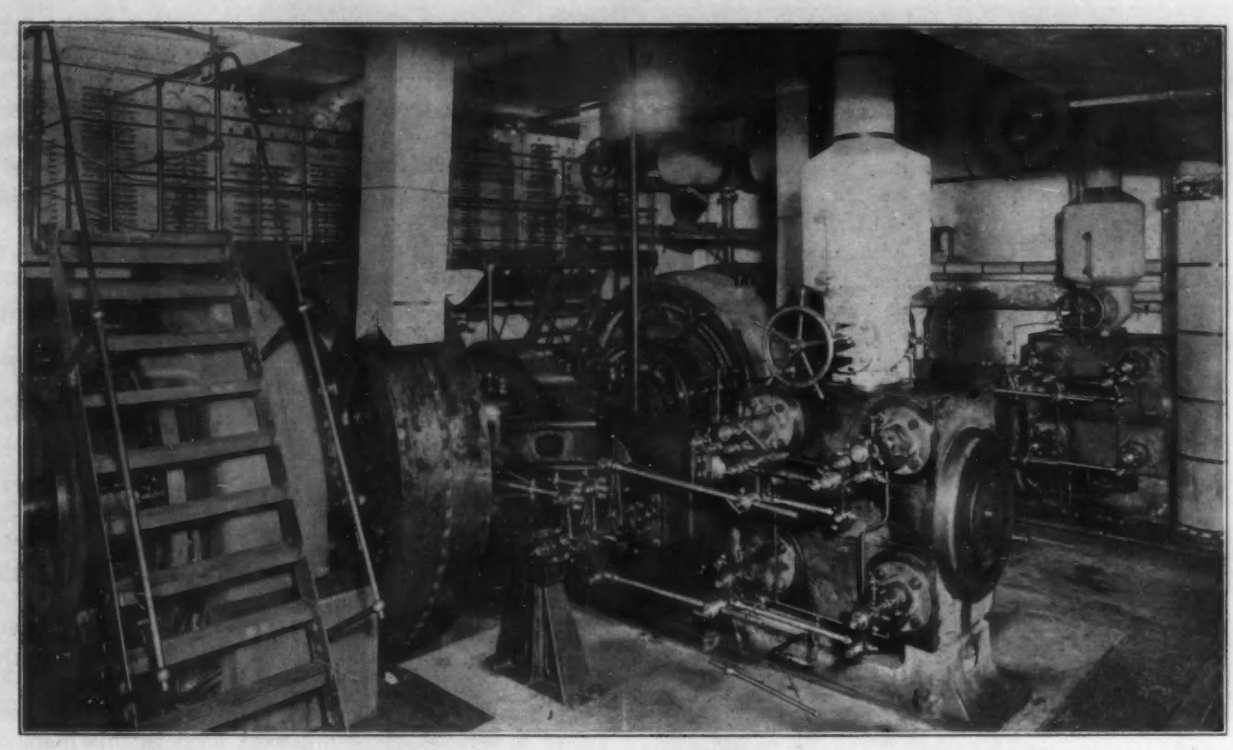


Fig. 2. General View of Engine Room.

steam header. These traps are all mounted upon the wall just to the right of the exhaust steam riser.

All engines discharge into a common 16 in. exhaust main, laid in a floor trench, which is provided with an iron cover. This main extends to the south wall, when it rises, then passes along the wall to a large oil separator, from which it continues to a Goubert heater, used for furnishing hot water to the laundry. A by-pass around this heater is extended directly into two 1200 h.p. Cochrane feed water heaters, near the Powell street wall in the old boiler room. From these heaters and other steam devices throughout the building, exhaust steam is discharged into the atmosphere by an exhaust main leading to the roof and running along side of the chimney. The exhaust steam main, laundry heater and bypass valve, as well as the separators at the engine throttles are clearly shown in Fig. 2. The small pipe shown in this same figure as passing over the distributing board supplies steam to the 75 kw. set under the gallery. All high pressure steam piping is of extra heavy wrought iron with heavy rolled steel flanges, but the exhaust steam lines are of standard wrought iron with regular cast iron fittings. The feed water mains and other high pressure pipes in sizes smaller than 5 in. are of wrought iron with standard fittings. The entire high pressure piping system was subjected to a hydrostatic test of 240 lb. after being erected. Both live steam and exhaust mains are carefully covered with asbestos covering.

In Fig. 2 there is shown an iron stairway leading to an L-shaped platform which passes along the front of the gallery to the by-pass and valves of the Goubert heater. Due to the crowded condition of the room it was thought advisable to provide this means of passing over the units. This stairway also furnishes a means of exit from the room to the chief engineer's office and electrician's shop; since the gallery extends over the entire front part of the room—that is, under the Powell street sidewalk.

Engine and Boiler Room Ventilation.

Since the large tapestry room of the hotel is directly above the new power plant it was necessary to install a special ventilating system to prevent heating this room. This system of ventilation was carefully planned and installed by Henshaw, Bulkley & Company, who guaranteed to keep the floor of the engine room cool at all times and to limit the temperature of the boiler room to within 15 degrees Fahrenheit higher than the outside temperature.

For this purpose there is installed two double-width Union Blower and Engineering Company's 90 in. full housing fans, each direct connected to an 18 h.p. 365 r.p.m. 220 volt commutating pole direct current motor. At this speed these fans deliver 29,400 cubic feet of air per minute, but each motor is provided with a speed regulator allowing the volume to vary according to the demand..

The air supply from the first fan is divided so that one-half is forced between the tapestry room floor and the boiler room ceiling, the rest is brought down through ducts terminating over each of the three larger units and discharging towards the boilers.

The second fan exhausts the warm air from the upper part of the room and over the boilers. Both fans are placed in two small rooms at the left of the 150 kw. set, but outside of the engine room. A separate room is provided for each fan. The fresh air intake ducts and also the exhaust duct terminate just outside of the north wall. This system of ventilation effectively accomplishes the purpose intended and no trouble from excessive heat is anticipated even during the hottest days.

Generators and Engines.

There are four generating units consisting of Harrisburg Fleming simple, non-condensing, four-valve engines direct connected to Western Electric Design "L" engine type generators of three different capacities. Two smaller units are rated at 75 and 150 kw. respectively and operate at 225 r.p.m. The two larger sets are each rated at 300 kw. at 150 r.p.m. The engines of the smaller units have their sub-base extended to support the generator, while the 300 kw. generators are provided with separate foundation plates set independent of the engine bases. The generators are three-wire compound wound machines designed for 125-250 volts at full load.

In general design and appearance these machines are similar to Western Electric standard two-wire generators of the same type; in fact, the resemblance is so close that many engineers who inspected this equipment have failed to notice the difference. Others have remarked that a three-wire, or double voltage generator, could not be built without the usual external balance coils. These facts cause the writer to believe that a brief explanation of the manner of deriving the neutral point for the system will be of interest.

The double voltage in these generators results from the use of a special balancing winding on the armature. The coils of this winding lie beneath the usual armature winding and at the bottom of the slot, which is made deeper for this purpose. This auxiliary, or compensating winding, is protected from damage, which might result from a burn-out of a coil in the main winding, by a practically fire-proof strip of insulation in addition to the ample insulation provided on the coils themselves. The section of copper in the auxiliary winding is liberal, thus keeping the current density low and enabling the machine to take care of large unbalanced loads without injury to any part. The neutral points in the balancing winding are connected to a brass collector ring mounted on the commutator cap from which it is thoroughly insulated.

The brushes for this collector or neutral ring are mounted on an extension of one or more of the regular brush-holder studs, being insulated from them. The brushes are of metallic carbon which wears slowly and gives a good contact of low resistance. The neutral wire is connected to these brushes and the system is operated without external balancing coils or additional apparatus.

In order to compound for the total load on the generator the series winding is divided with respect to the armature; the coils on alternate poles being connected to the same side of the armature. As a result of this design, the liability of breaking down the insulation of the series coils is reduced to a minimum, since coils having the full potential of the machine between them are not placed on the same pole. This arrangement further results in perfectly balanced magnetic and electric circuits.

The balancing winding is designed for a 25 per cent unbalance; that is, to operate satisfactorily with 25 per cent of the normal full load current flowing in the neutral wire. Under these conditions of unbalance, the difference in voltage between the two sides of the system will not exceed 2 per cent of the total rated voltage of the system. In other words, when the neutral is carrying 25 per cent of normal full load current, the voltage between neutral and outside wire on the loaded side will not be less than 122.5 volts and on the unloaded side not more than 127.5 volts, which is a difference of 5 volts or 2 per cent of the total voltage.

The voltage regulation for the 150 kw. machine operated on unbalanced load, as shown by factory test, was as follows:

Gen. Volts.	Amp. Output	Speed	Volts Neutral to Pos.	Volts Neutral to Neg.	Neutral Current
230	0	229	115	115	0
230	0	229	112.5	117.5	150
230	0	229	110	120	310
250	600	225	125	125	0
250	600	225	123	127	146
250	600	225	120.5	129.5	330

These tests show that for unbalanced loads the difference of potential between the two sides of the system is practically proportional to the amount of unbalance even up to double neutral current. It will thus be seen that with the system fairly balanced the regulation will be satisfactory.

Due to the small space available for the switchboard apparatus, the equipment used in this installation is quite different from that found in the average isolated plant, or even central station, of corresponding capacity. Several different switchboards following conventional designs were planned, but after careful consideration were given up in favor of a remote control equipment which could be more readily adapted to the conditions. This selection was largely influenced by the small head room available under the gallery where the switchboard was to be placed.

Circuit Breakers.

Each generator is protected by an I-T-E (Cutter Company) motor-operated, laminated circuit breaker, controlled from a suitable panel some distance away. The open and closed positions of the breakers are shown by red and green indicating lamps located at the point of control.

The breakers are of the three-pole overload type, each pole having an independent trip coil, the outside pole coils having a carrying capacity equal to the corresponding generator current, while the middle pole for the neutral lead is designed for 25 per cent of full load current. The outside poles are also equipped with equalizer contacts and all poles, including equalizers, close or open together.

All breakers are mounted upon oiled-slate panels, arranged in one bank which is placed under the distributing board gallery just to the left of the 75 kw. set. The panels are supported by an extra heavy double angle iron frame which is securely braced from the rear wall and also bolted to channel irons set in the cement foundation. This construction is well illustrated in Fig. 3. Each slate panel is divided into two sections, the upper containing the breaker and the lower the motor and operating mechanism. This division is of great convenience in shipping and when the breakers are being installed. To the writer's knowledge this is the first installation of these breakers on

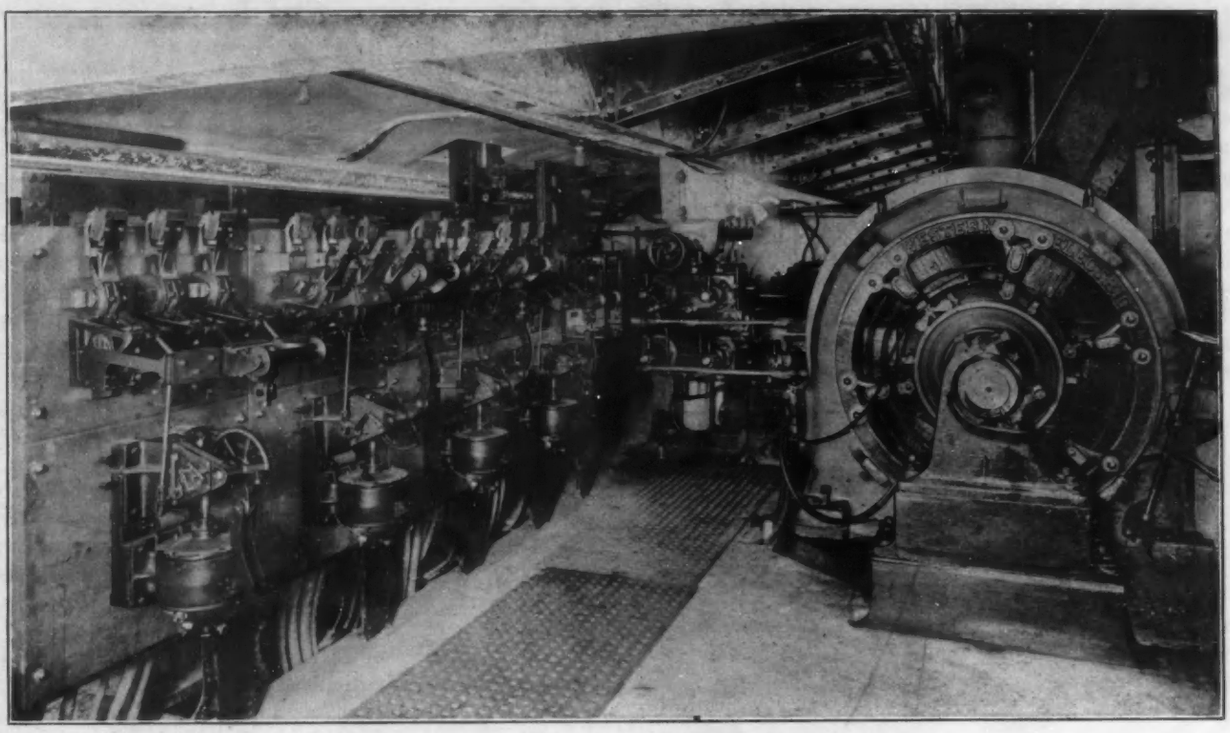


Fig. 3. Circuit Breaker Board and 75 kw. Units.

the Pacific Coast and as the operating mechanism is so cleverly designed, a detail description may be of interest.

The operation of these breakers will be understood by reference to Fig. 4 in which is shown diagramatically the essential working parts with the breaker in a closed position and the motor at rest. In closing the breaker, the movement of the motor is communicated to a gear sector A by means of a worm gear B connected by a ball and socket joint to an extension of the motor shaft; the gear sector is in turn connected by a link C to the breaker operating arm. During the act of closing, the worm B is forced into engagement with the gear sector by a magnet E connected in shunt with the motor fields. With the motor at rest, the worm is held out of mesh with the gear sector by means of the spring-actuated toggle D.

The motor movement and corresponding travel of the breaker operating arm is limited by the timing or limit switch, shown at F on the framework supporting the gear mechanism. This timing switch is automatically opened when the breaker is closed and closed when the breaker opens; the movements of the circuit breaker in both operations being transmitted to the switch by the vertical rod G.

With the breaker open and the timing switch in its corresponding closed position, the motor may be brought into the circuit from the control panel by means of an appropriate switch H, starting the motor through the resistance J. This resistance is short-circuited almost immediately by the action of the toggle D on the localizing switch I, which also connects the motor directly with the control circuit mains independent of the switch H.

The breaker is fully closed in about three-fifths of a second, at which time rod G operates switch F opening the motor and magnet circuits, thus throwing the worm out of mesh with the gear sector A.

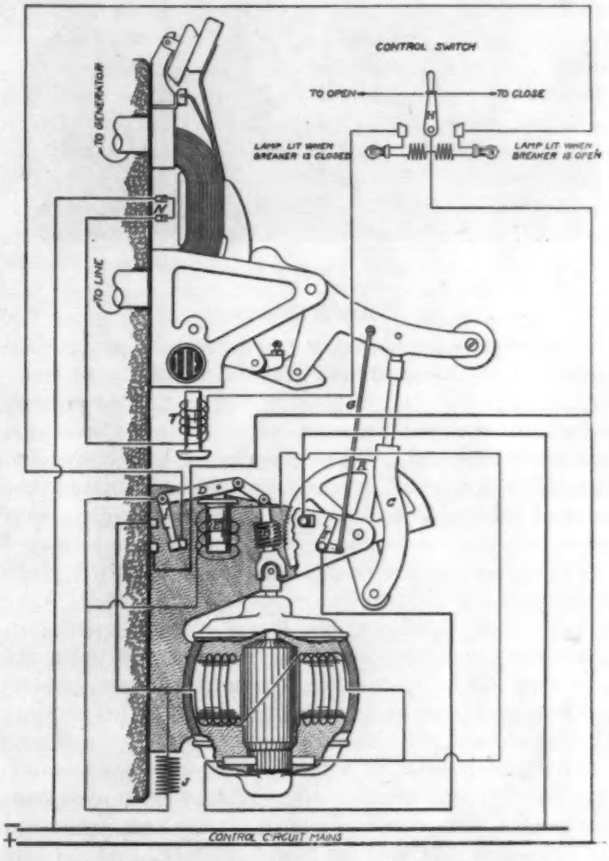


Fig. 4. Internal Connection of Circuit Breaker.

Should abnormal current conditions exist, either in the outside mains or neutral, the breaker is ready to respond instantly to the action of the regular over-

load coils and open without restraint or drag from the motor operating mechanism.

At the instant of closing, the control switch H is cut into the circuit by the contact N, ready to open the circuit breaker. Throwing the switch H to the opening position trips the breaker through the medium of a coil T, which action again throws the switch F into closing position. Due to the localizing switch I, the operator has no means of control from the time the motor is started until the breaker is fully closed. Further, the operator at the control panel cannot close the breakers against overload. The operating motors are 250 volt series wound machines, rated ¼ h.p. at 1650 r.p.m.

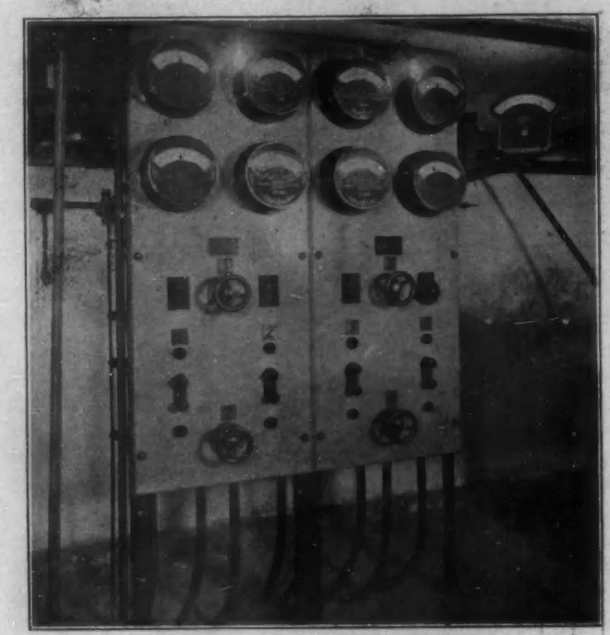


Fig. 5. Control Panels.

Control Panels.

As already explained, the breakers are entirely automatic in action and will respond instantly to overload even in the act of closing; hence, the usual hand switch in series with the generator leads is eliminated in this installation. The generators are connected directly to the circuit breakers by rubber insulated lead covered cables, laid in wooden lined troughs built in the cement foundation. These troughs are arranged to allow any particular cable being withdrawn without disturbing the others in the same trough. One trough is provided for the leads of each generator. The circuit breakers, including equalizer contacts, are connected directly to a single set of bus-bars, allowing any or all generators to be operated in parallel. These bus-bars are located directly back of the circuit breaker panels and supported by the same framework.

The circuit breakers are operated from two control panels, illustrated in Fig. 5, which are placed under the main distributing board gallery, just to the right of the 75 kw. unit. These panels are of blue Vermont marble, each 24 by 60 inches, mounted upon an angle iron frame braced from the rear wall.

Two Model 57 Weston ammeters, with scales of sufficient range to permit of about 50 per cent overload, one pull button control switch with red and green indicating lamps, one Ward Leonard field rheostat and a 6 point potential receptacle are provided for each generator circuit. The right hand panel contains an extra 6 point receptacle, also a Weston Model 9 illuminated dial voltmeter, scale 0-300, mounted on a swinging bracket.

The field rheostats are mounted upon an iron frame placed near the rear wall. Connections to the operating handles are made by one-half inch iron rods. This construction gives ample space at the rear of each panel to bring up conduits containing the various control wires without crowding. All control apparatus is placed in the same relative position as the corresponding breaker and generator controlled, which arrangement in addition to the number plates provided, tends to eliminate errors by the switchboard attendant.

Operation of the entire control apparatus will be readily understood by referring to Fig. 6 showing connections between the controlling apparatus and circuit breaker for one generator. Each unit is connected exactly in the same manner, hence a statement applying to one will cover all.

The internal connections of the circuit breaker in this diagram are identical as already shown in Fig. 4, except that the single pole knife switch indicated at H has been replaced by the pull button switch heretofore mentioned. Also the separate set of control mains shown has not been provided.

The control switches used are the twin pull button type made by the General Electric Company. In operation they perform the service of two separate single pole switches, but the parts are mounted in one piece. One button actuates the closing contacts and the other the opening contacts. The contacts are normally held open by a spiral spring, and the buttons are inter-locked mechanically so that it is impossible to operate both together.

Each switch is provided with an indicator which shows green after one button has been operated to open the circuit breaker, and red after the other button has been operated to close the breaker. The indicating lamps are connected to show the actual position of the circuit breaker, red when breaker is closed and green when it is open. These lamps are entirely independent of the pull switch indicator. Eight c.p., 140 volt clear tubular lamps with candelabra base, are used for this purpose. They are mounted in special receptacles, placed on the rear of panels.

While these lamps are usually described as red and green, they are actually clear lamps with receptacles provided with colored lenses on the front of the panel. The green lenses are placed above, and the red lenses below the pull switches. A V-shaped projection is cast on the front of the lenses to make the lamps plainly visible from a distance or when seen at an angle.

By tracing through the diagram it will be seen that the circuit containing operating motor and its accessories for closing the breaker is connected directly across the outside generator terminals, while the trip coil circuit is connected across the outside bus-bars. Each control circuit contains an indicating lamp and 500 ohm resistance unit, both of which are shunted by the contacts of the pull switch.

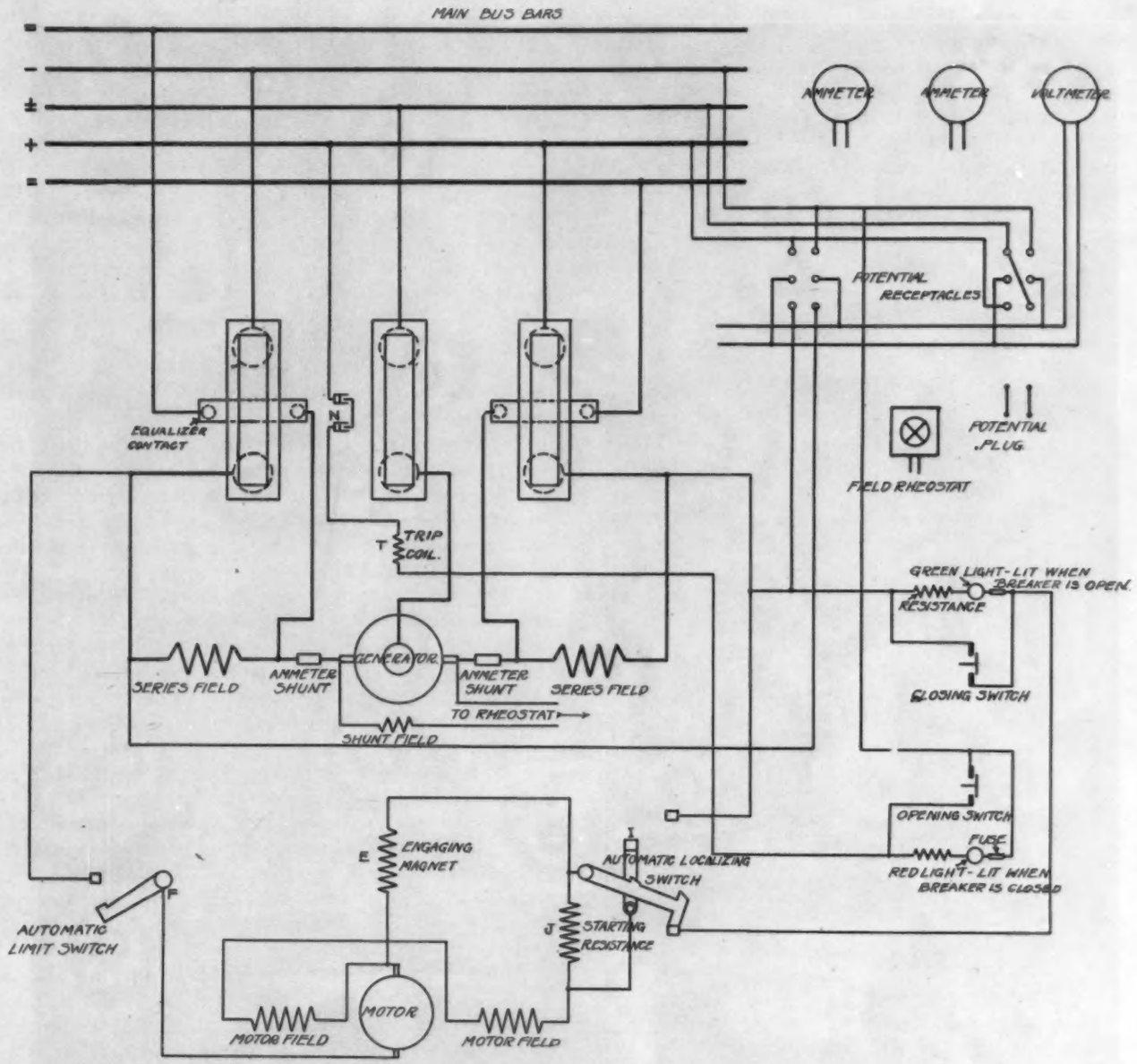


Fig. 6. Diagram of Connections for Generators, Circuit Breakers and Control Wiring.

With the foregoing explanation, the sequence of operations in starting a generator can be readily followed. First, having the corresponding circuit breaker open, the generator is brought up to normal speed—then with the potential plug in the lower position, the voltage is raised to its proper value, as indicated by the voltmeter. The green indicating lamp, which also acts as a pilot lamp during starting, will then be up to full candle power since it is in series with the closing circuit connected across the generator terminals. Thus a very small current will pass through the motor armature and fields and other parts of the control circuit, until the breaker is closed. Due to the low resistance of the motor, the difference of potential across its terminals is not sufficient to produce rotation, hence the motor remains at rest. The breaker is then closed by momentarily pulling the control switch button nearest the green lamp. This operation short circuits the lamp and resistance, placing the full generator potential across the motor terminals, causing it to quickly close the breaker. At the same time, the motor circuit is opened by the timing or limit switch, and the green lamp is extinguished. But the opening control circuit is now completed by the contact N, (Fig 4), hence the red lamp will burn at about normal brilliancy, although the amount of current flowing will not be sufficient to trip the breaker. The method of paralleling two or more generators does not require discussion, since the operation is the same for each uiit. Fig. 5 shows the board when the 150 and 75 kw. units are running in parallel, both at full load. The ammeters show how well the lighting load is balanced.

The breaker may be opened by pulling the button nearest the red lamp, which action short circuits both resistance and lamp, allowing sufficient current in the circuit to operate the trip-coil T, or the breaker may open due to the action of its overload coils. Either operation will again light the green lamp, but if the pull switch indicator and indicating lamps do not agree in color the operator at once knows the circuit breaker has tripped automatically from overload. This feature could hardly be considered of real importance

Night Illumination of Hotel St. Francis.

in this particular installation, as a breaker when opening would probably produce sufficient noise to attract the operator's attention. Further, the ammeters would immediately indicate the condition.

As already stated, the machine voltage is read by placing a potential plug in the lower position, while the upper position indicates the outer bus voltage. By means of the extra potential receptacle shown on the right in Fig. 6, the voltage between either main bus and the neutral can be read. The ammeters are connected directly to shunts mounted upon the generator head boards but for convenience the shunt leads are omitted in the diagram. Also the leads to field rheostat are not shown. For shunt leads No. 12 Habirshaw duplex rubber covered wire is used—each ammeter with corresponding lead and shunt having been calibrated after length of lead required was obtained. Each control circuit is properly fused although not shown in the diagram. All control circuits, including field rheostat leads and ammeter shunt leads are wired in iron conduit with Crouse-Hinds Condulet terminals. For control circuits No. 12 Habirshaw rubber-covered wire is used, while the field leads are No. 10 wire.

Distributing Mains.

From the main bus bars, the current passes through a 3000 ampere, 250 volt, three-wire Duncan watthour meter, mounted on a panel placed at the right end of the circuit breaker bank. This meter is in turn connected by a set of three bus-bars (one each for the positive, main and neutral leads) to the lower clips of a 3000 ampere, triple pole, double throw Crouse-Hinds knife switch, mounted almost directly above the watthour meter on the distributing board gallery. The upper clips of this switch are connected directly to the

118-236 volt three-wire alternating current mains of the City Electric Company, who supplied the entire hotel before the installation of this plant.

This switch is used only for transfer purposes in emergency and is not intended to be opened under any considerable load, as the outside service just mentioned can be handled by oil switches placed in the transformer manholes just outside the rear wall. Operating rods for these switches are extended through to handles mounted upon the wall back of the distributing panels.

The distributing board, partly shown in Fig. 2, consists of 13 panels of Vermont blue marble, 84 in. high and 26 ft. long. Three of the end panels at the right control power circuits and other circuits that must always be supplied with direct current—the remaining ten panels control the various lighting circuits which may be operated from either direct or alternating current. The latter panels are supplied from a set of bus-bars connected to the middle points of the emergency switch so that the lighting circuits receive alternating current with the switch thrown to the upper position and direct current from the local plant when in its lower position.

To supply the power circuits the City Electric Company furnish 110-220 volt three-wire direct current service, which is also used in emergency. A 500 ampere, three-pole double throw fused switch mounted on a separate panel back of the main distributing board is provided, so that the three power panels may be supplied from the local generators or the outside service. This switch is connected to the lower lugs of the large transfer switch by three lead covered cables laid along the wall on the distributing board floor. This scheme of connections is shown in Fig. 7.

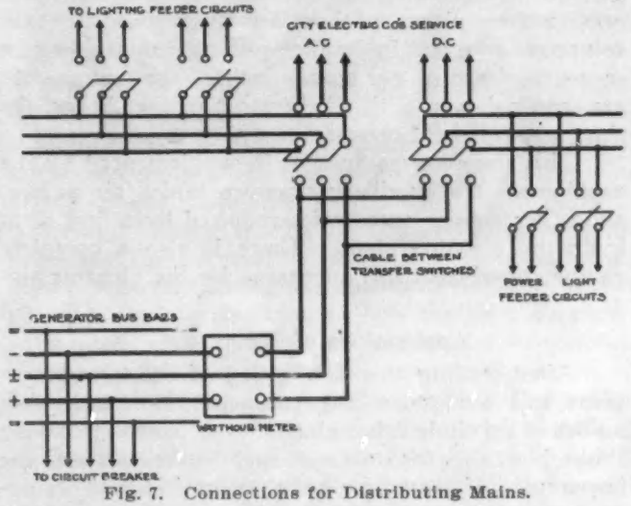


Fig. 7. Connections for Distributing Mains.

Altogether there are 101 feeder switches of various sizes, some two-pole and others three-pole. All lighting circuit switches are double throw with both sets of fuses connected to the same bus. This scheme enables the operator to transfer a circuit to good fuses without delay.

A Bristol recording ammeter and voltmeter is provided for each side of the system on the lighting panels. There is also a voltmeter with necessary potential plugs, enabling the voltage across either outside main and the neutral to be read. Both voltmeter and Bristol instruments will work on either direct or alternating current, so they are not injured when the system is transferred to outside service—although the accuracy is considerably affected.

The last power panel contains a Duncan watthour meter which records the energy used by the electric range in the men's grill room.

The entire distributing board, excepting the transfer switches was installed several years ago; hence, is not part of the new equipment. Leads from the distributing board are run in conduits to various distributing centers throughout the building in accordance with standard practice.

Original Boiler and Pump Rooms.

The old boiler room previously mentioned is situated just to the south of the new engine room. It extends from the Powell street wall back for a distance of about 45 ft., the rear wall coming about in line with the front of the new boilers. The room is about 32 ft. in width. Connection to the new room is made by a narrow passage way running between the rear wall and boilers.

The original boiler equipment consists of four Babcock and Wilcox boilers, each of 83 h.p., all connected to a common steam header now extended to the new boilers. This gives the plant a total of 1190 h.p. boiler capacity. These boilers are set in the usual manner and are equipped for burning oil.

Water for these boilers and the new ones as well is pumped from the Cochrane heaters by two 10x6x10 Snow duplex pumps. The old boiler room in addition contains numerous other pumps, heaters and water filters, to be described later.

Still further to the south there is another room in which are numerous water and vacuum pumps, an ice and refrigerating plant, ventilating apparatus, machinery for pneumatic tube system, vacuum cleaning plant and terminal room for telephone exchange, all of which will be covered briefly in the following paragraphs.

This room is in the shape of an L—one side being just opposite the front of the old boilers and the other side, extending just back of the boiler room rear wall. It is on a level with the main hotel basement, but about 8 ft. above the level of the old and new boiler rooms. A flight of cast iron stairs lead down to the old room in line with the passage to the new plant. It might further be stated at this point that all rooms have at least two entrances so that in case of emergency there would always be means of escape.

Water Supply.

The general water supply for the building is taken from the mains of the Spring Valley Water Company. The water first passes through four Jewell filters, each of about 1500 gallons capacity and then to a main supply tank in the old boiler room. From this tank the water is pumped into four house supply tanks on the roof having a combined capacity of 32,000 gallons. This pumping is done by two 10x6x10 Dow vertical duplex pumps and one 10x5x10 Worthington compound duplex pump.

Due to the large capacity of the house tanks, the hotel has a reliable source of water supply for

fire purposes. Throughout the building there are many hydrants or water plugs connected directly to these tanks by a separate system of mains. The valves for these mains are always open, keeping the hydrants ready for immediate use. Should the pressure from the tanks not be sufficient, the two vertical duplex pumps just mentioned can be instantly converted into high pressure fire pumps, taking their water supply direct from the city mains and pumping directly into the mains supplying the hydrants.

There are also two pumps used in supplying the baths on the twelfth floor. One a 6x4x6 duplex Worthington pump, supplies fresh water, the other a Smith Vaile pump of the same size handles the salt water supply which is taken directly from the mains of the Olympic Water Company, whose mains extend directly to a pumping station on the ocean beach.

Hot water for the entire building is supplied from three heaters near the old boilers. Ordinarily these heaters are operated from exhaust steam, but if this is not available, live steam is used. After passing from the heaters through the various mains the water discharges into a return header placed near the heaters. From this header the water is again pumped into the heater by a 6x4x6 Worthington duplex pump.

This system of circulating not only insures a uniform temperature throughout the mains but also is less severe on the plumbing fixtures since without the circulating pump the water must be kept at a high temperature to produce even fair circulation over such a large system and high temperature rapidly destroys the valves and pump packing.

Heating and Ventilating System.

In a hotel of this size, which is constantly occupied by from 800 to 1500 persons, an efficient system of ventilation is essential. For the ventilation of the dining rooms, cafe, main lobby and other large public rooms there is installed two 12 ft. Sturtevant fans each direct connected to a slow speed steam engine. One of these handles the fresh air supply and is equipped with an air washing device for cleaning or purifying the air supplied. This device further tends to keep the air supply cool at all times. A set of steam heating coils is also placed in the discharge duct of this fan, enabling it to supply warm air when necessary.

The ballroom is supplied by a separate system of ventilation much on the order of that just described. Two large blower fans operated by electric motors are supplied for this purpose. These fans are so designed that either may be used as a discharge or suction fan. One is placed in the basement and the other in the laundry on the fourteenth floor.

Normally the basement fan, also equipped with an air washing device and steam heating coils, is used to draw in fresh air which is discharged into the top of the ballroom. The laundry fan in turn removes the foul air through an air duct entering at the floor of the ballroom and discharging above the hotel roof. This arrangement of apparatus not only gives thorough ventilation but brings in the cool air at a point where it will not be unpleasant to the occupants. In fact, the system works so well that the laundry fan is run only on special occasions. Throughout the building there are also numerous electric driven ventilating fans for rooms requiring special ventilation.

As already stated, the main lobby, dining rooms, and other public rooms are heated by a system of indirect ventilation—that is by the steam coils in connection with the ventilating fans. The guest rooms and other parts of the building are heated by a system of direct radiation, the radiators being supplied entirely by exhaust steam. A double set of vacuum pumps are provided to remove the condensed steam from the radiators and mains and pump it into the Cochrane heaters used for supplying water to the boilers.

Refrigerating and Vacuum Cleaning Apparatus.

The hotel has a complete refrigerating system which includes a Vulcan Iron Works refrigerating machine and a 6x4x6 Worthington pump which circulates brine for refrigerating purposes in the various cold storage rooms throughout the building. This plant has a capacity of five tons of ice and twenty tons of refrigeration daily. In connection with this equipment, there is provided an ice shaving and cubing machine, driven by an electric motor, for preparing ice used in the buffet, dining rooms, etc.

The vacuum cleaning outfit consists of a steam driven vacuum sweeper having a capacity of eight lines. When operating at 120 r.p.m. this machine develops a vacuum of 14 inches. In conjunction with this sweeper there is an air compressor for blowing out the sweeper lines when they become stopped up in any manner.

Elevators.

Throughout the hotel all elevators are of the hydraulic plunger type. These consist of five passenger, one freight and two service elevators. For operating these elevators there are three 16x25x18x13½ compound duplex hydraulic pumps maintaining a pressure of 140 lb. per square inch. Two pumps only are required even with all elevators in use; hence, the third pump is held in reserve.

This pumping equipment is supplemented by the usual main and auxiliary pressure tanks, air pumps, and other similar accessories required by a first class hydraulic elevator plant. There is also a complete equipment of electrical apparatus for the elevator signals.

Applications of Electricity.

After reading this description of the new power plant and noting its large capacity, the reader has no doubt concluded that electricity is used extensively throughout this institution. Such is the fact and the importance of electricity as a potent factor in its operation could not be thoroughly appreciated without a trip through the various departments.

The largest variety of applications is found in the laundry which is complete in all details and prepared to handle any class of work. Here electricity is used for light, heat, power and communication.

The heaviest of this equipment comprises six washing machines and five extractors or centrifugal wringers, arranged in two rows, and driven from two line shafts operated by a 25 h.p. motor. There are also two driers of the conveyor and sectional type each driven by motors of one h.p. capacity.

Other machines in this department include a sleeve ironer, a band ironer, a collar and cuff machine, a bosom press, two body ironers, a finishing table and two large mangles; the latter driven by individual motors having reversible speed controllers. Some of the other machines mentioned have individual motors and many are driven in groups from a line shaft. The body, sleeve and band ironers are also electrically heated. In addition ten electric irons of various sizes and makes are in use.

In the kitchen are two motor-driven dish-washing machines; on the fourteenth floor electric motors operate the silver polishing machines, and the presses in the printing room; in the sewing room there are six machines having individual motors. In the entire building the output of electric motors aggregates about 125 h.p. Practically all of the motors are wound for 220 volts, although a few of the smaller ones are 115 volt machines. All of the heating apparatus is operated at 118 volts.

Another interesting application of electricity is found in the men's grill. Here the range is entirely dependent upon electricity. It is divided into two sections used alternately one week at a time. Each section contains numerous small compartments and a large oven. In this range special heating units are not used; Krupp wire being used entirely for this purpose. This wire is wound in spirals and mounted upon porcelain insulators. The various sections are operated at almost a white heat and each section is connected directly across the 236 volt circuit, with no provision for more than one heat.

Means of Communication.

In the operation of a large hotel, first class service is dependent upon an efficient means of communication between the guest rooms, office, various departments and the outside world. For this service the modern telephone equipment is of course, without a superior, but it is usually supplemented by the pneumatic-tube system. In this hotel the very best of telephone service is supplied by the Pacific Telephone & Telegraph Company, who have spared no expense in providing the necessary equipment. Telephones are used extensively throughout the entire building, aggregating about 780 instruments. On the main floor just back of the clerk's desk there is a special six-position Western Electric switchboard. During the hours of heavy traffic five operators and a chief operator are on duty—at other times the number varies according to the demand for service.

Connection between this switchboard and the main telephone office in Bush street—known as the Douglas exchange—is made by 28 trunk lines. No special trunk lines for toll connections are provided, but long distance communication can be held from any phone connected to the exchange. From this exchange there are many long distance calls. The number is not surprising, however, when it is remembered that the toll lines of the Pacific Telephone & Telegraph Company completely cover five entire States on the Pacific Coast. Calls for Los Angeles, 500 miles distant, are frequent and occasionally communication is held with Seattle, 1000 miles from San Francisco.

A terminal room containing all of the necessary line and trunk relays, protective apparatus, cable connections and other accessories is situated directly under the switchboard on the main basement floor.

The storage battery and its controlling panels are also installed in this room. Two batteries, each consisting of twenty "Chloride Accumulator" cells having a capacity of 120 ampere hours are required for this system—one set being charged while the other is in use. Charging current is taken directly from the main distributing board through a panel containing suitable instruments, charging rheostats and transfer switches. The terminal room apparatus, as well as the switchboard has an ultimate capacity of 1200 lines which will probably be used in the near future. The storage cells are mounted in cabinets which are thoroughly enclosed and ventilated to prevent acid fumes from deteriorating other apparatus in the same room. This system is directly in charge of the telephone company, who have an attendant on duty during the day. His time is devoted entirely to the telephone installation. At night the hotel can call assistance if necessary from the main office.

Public telephone stations of the Pacific Telephone & Telegraph Company and the Bay Cities Telephone Company are also located in this hotel. As an additional means of communication the Postal and Western Union Telegraph Companies maintain offices in the hotel lobby.

Pneumatic Tube System.

For the transmission of orders, letters, etc., a pneumatic-tube system of the vacuum type, supplied by the Lamson Consolidated Store Service Company, has been installed. A blower, required for the operation of this system, is placed in the main basement near the ice machine. It is driven by a variable speed motor automatically controlled by a special regulating device which changes the speed according to the amount of vacuum required. Low voltage current for operating the valves at the various tube terminals is furnished by a small motor generator set, placed near the regulating device. The tube clerk's room or main station is on the main floor, near the telephone switchboard.

As part of the means for communication, the electric carriage call system may also be included. The calling or signalling is entirely silent and is done with apparatus manufactured by the Electric Carriage Call Company.

In the indicator there is a nest of special receptacles, each containing a small lamp, so arranged that by lighting the proper lamps any number from 1 to 999 may be formed—there being three groups or sets of receptacles.

Control wires from the indicator run to a special switch near the main entrance. This switch is made up of a series of upper and lower contacts, the former terminating flush with a rubber plate holding them in place and insulating one from the other—and the latter in the form of round spring-actuated plungers, all mounted upon a common handle or support. Each set of contacts is arranged in the same relative position as the corresponding lamp controlled.

When it is desired to show a certain number on the call a card bearing perforations forming that number is placed in the switch between the contacts. Then the handle is pressed down, allowing all contacts necessary in forming the required number to come together. When the handle is released, all contacts separate and the numerals disappear.

Lighting.

For lighting of the entire hotel about 10,000 Sunbeam incandescent lamps are used. While a large number are tungsten lamps, there are also numerous tantalum and carbon filament lamps. All types include a large variety of special size and candle-powers.

Throughout the various public rooms there are a number of beautiful fixtures and particularly in the main dining-room and ballroom are the fixtures of exceptional artistic and mechanical design. Large electroliers are suspended from the ceilings and in many rooms these are supplemented by artistic wall brackets in keeping with the room decorations. The guest rooms and halls are also well lighted.

The exterior lighting of the hotel has been carried out on a large scale and is probably the most beautiful installation of the kind in the West. The entire front outline of the building from the lowest window sills to the roof is strung with electric lights. The system is a permanent one. It consists of weatherproof receptacles placed in Crouse-Hinds condulets joined together by sections of iron conduit, carefully fastened to the exterior of the building. Habirshaw duplex rubber covered wire is used for this work. Altogether there are about 2000 eight c.p. Sunbeam carbon filament lamps.

This elaborate system of decoration is supplemented by an artistic lighting effect in the form of an electric flag on the roof of the building. The body of the flag is about 14 ft. high and 16 ft. long. It contains about 400 eight and sixteen c.p. Sunbeam carbon lamps grouped in 32 circuits. The color effect is arranged to produce an American flag which is given the appearance of continually waving by means of a large flasher.

While the lighting features just mentioned are permanent, the St. Francis Hotel frequently uses elaborate temporary electrical decorations for special occasions. An excellent example of this is shown in the view illustrating the night illumination. This view was taken during the recent aviation meet and shows a model of an airship covered with 500 four c.p. lamps. The electric flag is also well illustrated in this view.

Each year during the Christmas holiday festivities, this hotel has a beautiful Christmas tree decorated with from five to six hundred miniature lamps. The tree is mounted upon a platform and is continually revolved by a small motor, much to the amazement of the thousands of children who come to see it.

From this brief account it will be seen that practically every improvement known to the electrical and mechanical industries have been embodied in this hotel, in an effort to give the best of service and real comfort of the guests.

The engines and boilers for the new plant were furnished and installed by Chas. C. Moore & Co., the steam piping by the Moore & Scott Iron Works, while the entire new electrical apparatus was furnished by the Western Electric Company, who also installed the generators. The switchboard equipment and wiring was installed by Mr. W. H. Kimball, chief electrician of the hotel, under the direction of Mr. M. Haley, who is chief engineer in charge of the entire plant. The writer is indebted to the hotel staff for much of the information in this article and also to Mr. A. Z. Hirsch for drawing the various diagrams throughout the article.

AN EARLY APPLICATION OF ELECTRIC POWER FOR INDUSTRIAL PURPOSES IN SAN FRANCISCO.

BY ORION BROOKS.

In the year 1877 an attempt was made to supply electric light in San Francisco. The plant comprised a vertical steam boiler and engine of about 15 h.p., a Siemens dynamo electric machine of about 2 h.p., a Gramme alternator and its exciter with a capacity of 16 Jablochkoff candles, located in a loft at 412 Market street. Stephen D. Field was the electrician of the venture and the location of the plant, on the third floor of the building, necessitated much labor in hoisting the necessary wood and coal by means of a primitive hand operated elevator. Mr. Field conceived the idea that he could avoid a good deal of manual labor and incidentally carry out some experiments by belting his electric machines to the elevator.

Accordingly, he fitted a grooved pulley to the shaft of the Siemens machine and prepared an endless rope belt which he passed round the elevator rope wheel and the pulley of the Siemens machine; then, feeding current from the Gramme exciter to this Siemens machine he had an installation of electric power which he continued to use until the affairs and machinery passed into other hands some months later.

The writer having been a resident of San Francisco since 1867 since which time he has been closely identified with electrical ventures, believes this to have been the first application of electric power industrially in San Francisco.

INTERNATIONAL CONGRESS OF THE APPLICATIONS OF ELECTRICITY, TURIN, 1911.

An International Congress of the Applications of Electricity will be held at Turin from the 9th to the 20th of September, 1911, on the initiative and under the auspices of the Italian Electrotechnical Association and of the Italian Electrotechnical Committee, during the period of the International Exhibition of Industry and Labor.

Purification of boiler feed water so as to prevent boiler scale is being accomplished by three English railways by merely allowing the water to flow over an aluminum plate. This is said to soften the scale from calcium and magnesium salts so that a soft mud is formed instead of a hard scale.

PRESENT STATUS OF PRODUCER GAS FROM CRUDE OIL.[1]

BY E. C. JONES.

The subject of making producer gas from crude petroleum or its products is not sufficiently crystallized from the fluid state to give figures necessary to exactly determine its economy. California with its immense deposits of petroleum is the natural and logical field for the exploitation and industrial use of oil producer gas. It is to be deplored that such an important subject was first considered by men not conversant with the manufacture of oil gas, and in casting about for apparatus to make producer gas from oil they naturally gravitated to the old familiar methods of retorting the oil, and any improvements that grew out of these methods seem to have retained the objectionable features of the retort system. Briefly stated these objections consist of the necessary shut downs of the machine for the purpose of removing coke and frequently for burning out accumulated soot and lamp black. A typical analvisis of gas made in this way is:

CO_2	4.5	CH_4	12.0
CO	7.4	H_2	3.1
O_2	0.4	N_2	71.9

British thermal units per cubic ft. 172. Claimed thermal efficiency 39 to 62 per cent. Operating thermal efficiency 55 per cent.

This gas has been applied to the operation of small gas engine units up to and including 100 h.p. Owing to the abundance of petroleum in California, it has superseded all crude material in the manufacture of illuminating gas. To attain its present degree of perfection elaborate and extensive experiments were performed for the purpose of so changing the chemical and physical condition of the gas to best adapt it to modern domestic and industrial gas appliances.

The first oil gas manufactured on a large scale in California has the following analysis:

Heavy hydro carbons	6.2
Marsh gas	26.6
Hydrogen	62.4
Carbonic oxide	3.0
Carbonic acid gas	0.2
Oxygen	0.4
Residual nitrogen	2.2
	100.00
Specific gravity	.303

By improvements in apparatus and refinements of operation the hydrogen content of the gas has been reduced to less than 40 per cent; the marsh gas has been increased to 34 per cent; the carbon monoxide has been increased to 9 per cent; the specific gravity to .485, and the British thermal units from 624 to 680 per cu. ft. The oil gas generators used at present for manufacturing illuminating gas are so elastic in their operation that any of them can be immediately adapted to the manufacture of producer gas from oil. The chemical composition of the gas and its heating value depending only on the manipulation of the generator.

The writer has carried on a series of experiments with oil producer gas, using a large generating unit and the only change in equipment was the use of compressed air at from 35 to 40 pounds pressure for the injection of oil and to assist in the partial combustion of the oil. During these experiments producer gas was made, having a thermal value as low as 103 B.t.u. per cubic foot, and as high as 482 B.t.u. per cubic foot. Unfortunately no ready means was at hand for measuring the quantity of gas made and the amount of oil used to produce 1000 cubic feet. A typical analysis of this gas is as follows:

Carbonic acid	4%
Heavy hydro carbon	2% or less
Oxygen	1
Carbon monoxide	5
Hydrogen	5
Marsh gas	8
Nitrogen	70

This gas has a calorific value of 160 B.t.u. per cubic foot. To use this gas successfully in gas engines it is necessary that it shall be thoroughly cleansed by efficient scrubbing, and that it shall be uniform in calorific value and chemical constituents. This last can be readily accomplished in the operation of oil generators, used as producers, by careful measurement of the oil used, and the air supplied for its partial combustion, and the maintenance of a fairly constant temperature in the generator. This can be done as in oil gas manufacture by a determination of the necessary temperature by the observation of color in the checker brick and the maintenance of this temperature by frequent observations through sight cocks by the gas-maker.

Making producer gas from oil in the ordinary gas generator has many advantages over any special process. The gas can be made in very large quantities and the amount made can be easily regulated to the needs. The operation is continuous and without interruptions for cleaning. This is essential in the manufacture of producer gas for power purposes. In any other known process the interruptions are not at stated intervals, but occur when the producer refuses to work, owing to the clogging up of its parts by coke or lamp black. Oil gas generators have no easily destructible parts as the lining and checker brick are constructed with a view to resisting high temperatures and although a much higher temperature is desirable in making producer gas than that employed in making oil gas the checker brick are not seriously affected by the high temperature. In the decomposition of oil, in the presence of air, there is a complete disposition of all the gas making constituents of the oil so that producer gas can be made without a by-product of any kind. Any accumulation of carbon in the generator may be removed by adjusting the temperature and quantity of air supplied. This method of making gas requires a small gas holder for momentary storage, and the process as at present understood could not be used as a suction gas producer. Producer gas made from oil and containing a small percentage of hydrogen possesses advantages over illuminating oil gas inasmuch as it can be subjected to higher compression in gas engine cylinders, and with a gas of uniform analysis, uniform piston speed can be obtained. A thought upon the possibilities of oil producer gas leads to a comparison of the modern steam turbine with thermal efficiency of from 12 to 15 per cent with an internal combustion engine with a thermal efficiency of from 24 to 30 per cent.

[1]Paper presented at San Francisco meeting, American Society of Mechanical Engineers, December, 1910.

DEPTH OF SNOW IN THE SIERRA.

BY PROFESSOR A. G. McADIE.

It is a matter of general interest to the public and of special significance to the engineer to have some clue as to the prospective water supply and the probable rate of melting of the snow in the mountains. We are fortunate in California in that for many years through the co-operation of the engineering corps of the Southern Pacific Company and the Weather Bureau, records of the depth of snow have been maintained for a long period. The snow problem is an important one and while we are not altogether satisfied with methods of determining the water content of a given snow cover, the scale measurements of depth of snow furnish a basis for comparing any one year with another.

One of the most important snowfall stations in the country is that at Summit, Placer County, California, elevation 7,017 feet. The table given below shows that there has been an accumulated depth of snow on the ground frequently exceeding 20 feet; also that the total seasonal snowfall has several times exceeded 50 feet, and in two seasons has exceeded 60 feet.

SEASONAL SNOWFALL AT SUMMIT, CAL.

Elevation, 7017 feet; latitude, 39° 19′ N.; longitude, 120° 10′ W.

Winter of	Snowfall. Inches.	Winter of	Snowfall. Inches.	Winter of	Snowfall. Inches.
1870-1	300	1884-5	202	1897-8	262
1871-2	550	1885-6	462	1898-9	481
1872-3	334	1886-7	422	1899-1900	406
1873-4	200	1887-8	345	1900-1901	440
1874-5	284	1888-9	261	1901-2	373
1875-6	525	**1889-1890**	**776**	1902-3	407
1876-7	178	1890-1	335	1903-4	434
1877-8	341	1891-2	380	1904-5	375
1878-9	446	1892-3	634	1905-6	514
1879-1880	**783**	1893-4	511	1906-7	602
1880-1	154	1894-5	685	1907-8	340
1881-2	492	1895-6	544	1908-9	442
1882-3	299	1896-7	560	1909-10	342
1883-4	482			1910-11 (to date.)	402

In 1908 Professor J. N. Le Conte, using this table as a basis, published in the Sierra Club Bulletin a short paper having for its special purpose the possibility of predicting the probable date of disappearance of the snow with the view of determining when travel would be safe through the mountains. The attempt was made to get the average rate of melting. Eleven plats showing the depth of snow on the ground for eleven different years were discussed. In each of these there was an extremely irregular curve, increasing until the last week in March. After the end of March the curve decreased rapidly and was fairly smooth. In the accompanying illustration there is shown the average depth of snow on the ground at Summit with a maximum of 129 inches about March 26th. The curve ABCD is the average depth of snow obtained by taking the total depth for the 10 years for a given date

SUMMIT, PLACER CO., CAL. (Elevation, 7,017 feet.)

Season.	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	Seasonal	Year	Annual
1870-71	.....	.....	.....	.....	.....	.....	7.60	7.55	4.05	4.00	0.31	0.89	.....	1871	60.60
1871-72	0	0	0.30	0.40	8.50	27.00	4.00	16.10	5.90	5.60	0.30	0	68.10	1872	37.90
1872-73	0	0	0	0	0	6.00	2.31	16.20	6.05	2.55	2.11	0	35.22	1873	40.95
1873-74	0.03	T	0	0	0	11.70	5.00	0	0	2.00	3.60	T	22.33	1874	18.85
1874-75	0	0	0	3.80	3.60	0.85	8.15	0.12	4.80	0.80	1.46	2.55	26.13	1875	*33.86
1875-76	T	0	0	*2.23	6.50	7.25	14.65	8.70	13.80	2.60	1.60	T	*57.33	1876	46.90
1876-77	1.21	0.10	0.56	2.98	0.50	0.20	8.90	0.69	3.44	4.84	3.75	0.12	27.29	1877	26.73
1877-78	0	0	0.30	0.55	3.34	0.80	10.00	11.50	3.05	2.40	1.60	0	33.54	1878	32.69
1878-79	0	0.09	0.44	1.91	0.80	1.60	13.65	8.70	21.05	4.52	2.55	0.10	54.71	1879	73.67
1879-80	0	T	0	4.20	5.60	13.30	6.60	7.50	8.90	30.40	3.60	0	80.10	1880	64.50
1880-81	0.80	0	0	0	0.50	6.20	7.50	4.60	1.50	1.00	0.05	0.50	22.65	1881	30.95
1881-82	0	0	0.60	3.10	3.05	9.05	7.40	9.00	19.30	3.25	0.60	0	55.35	1882	62.12
1882-83	0	0	0.75	12.95	3.95	4.92	1.00	2.60	7.70	3.40	3.42	0	40.69	1883	23.57
1883-84	0	0	0.10	0.95	1.20	3.20	7.60	12.70	9.10	12.60	0.80	4.04	52.29	1884	60.47
1884-85	0	0	1.10	3.13	0	9.40	1.40	0.58	0.10	4.88	1.00	0.80	22.39	1885	25.41
1885-86	0	T	0.05	0	13.60	3.00	13.90	1.40	7.80	6.40	0.95	0	47.10	1886	41.00
1886-87	0	0	0	3.10	1.70	5.75	6.25	20.70	1.40	5.80	0.95	1.60	47.25	1887	49.97
1887-88	0.10	T	T	0.07	1.50	11.60	9.20	1.29	8.05	2.30	1.04	3.72	38.87	1888	26.55
1888-89	3.51	0.28	0	0	1.90	5.26	1.00	1.50	9.55	1.90	6.30	0.22	31.42	1889	51.42
1889-90	0	0	0	5.65	6.80	18.50	19.20	11.60	14.00	2.60	0.25	0	78.60	1890	55.05
1890-91	0	0	0	0	0	7.40	1.50	1.38	5.10	4.60	1.10	0	21.08	1891	*26.13
1891-92	0	0	*0.20	0.05	0.30	11.90	4.00	3.40	7.40	4.50	6.30	0.20	*38.25	1892	44.70
1892-93	0	0	0	0.60	8.80	9.50	7.90	10.80	14.50	9.20	0	0	61.30	1893	52.30
1893-94	0	0	0	0.30	3.60	6.00	15.50	15.25	3.40	4.30	2.40	0	50.75	1894	69.75
1894-95	0	0	0.50	2.90	1.00	24.50	25.80	4.20	4.70	2.50	2.40	0	68.50	1895	49.50
1895-96	0	0	0.20	0	1.40	8.30	10.50	0.70	9.70	18.20	5.40	0	54.40	1896	*62.43
1896-97	*0.21	*0.02	0.40	0.90	12.30	4.10	4.05	14.35	18.00	1.25	0	0.70	*56.28	1897	47.73
1897-98	0	0	0.03	2.50	2.65	4.20	4.00	7.10	5.20	0.80	2.90	0.90	31.28	1898	31.40
1898-99	0	0	0	4.40	2.50	3.60	12.70	5.20	15.75	1.75	3.60	0.70	50.20	1899	73.80
1899-00	0	1.00	0	16.05	9.15	7.90	5.25	4.75	8.15	4.80	3.97	0.50	61.52	1900	42.52
1900-01	0.25	T	0.95	3.50	6.90	3.50	11.30	14.20	4.50	5.50	1.00	0	51.60	1901	49.60
1901-02	0	0	1.40	4.20	4.70	2.80	4.00	16.30	8.90	3.00	1.10	0.30	46.70	1902	49.00
1902-03	0	1.00	0	2.30	7.50	4.60	10.50	3.20	11.10	1.70	0.80	T	42.70	1903	40.50
1903-04	0	0	0	1.20	11.20	0.80	4.20	30.40	21.30	3.90	0.23	0.05	73.28	1904	76.54
1904-05	0.04	0.03	4.56	1.90	1.33	8.60	5.55	7.00	10.70	2.90	3.70	1.40	47.71	1905	43.85
1905-06	T	0	0.50	0.60	7.80	3.70	14.10	9.30	11.75	2.60	4.12	2.10	56.57	1906	57.55
1906-07	T	1.00	0.32	0.12	2.04	10.10	13.50	4.38	27.36	2.66	3.06	2.22	66.76	1907	66.48
1907-08	0.12	T	0.06	2.52	0.40	10.20	3.50	4.50	10.20	1.14	3.70	0.44	36.78	1908	33.28
1908-09	0	0.76	1.20	1.54	3.60	2.70	29.44	8.94	4.60	0.40	1.10	0.88	55.16	1909	*60.62
1909-10	0	0	0.72	1.66	*4.58	8.30	8.60	5.10	4.98	0.68	0.53	0	.....		.....
1910-11	1.16	0	2.82	0.50	5.46	4.08	28.90	5.30	.....	.....	.....	.....	.....		.....
Means	0.16	0.11	0.39	2.35	3.97	7.39	8.78	7.91	9.02	4.60	2.13	0.64	48.29		48.07

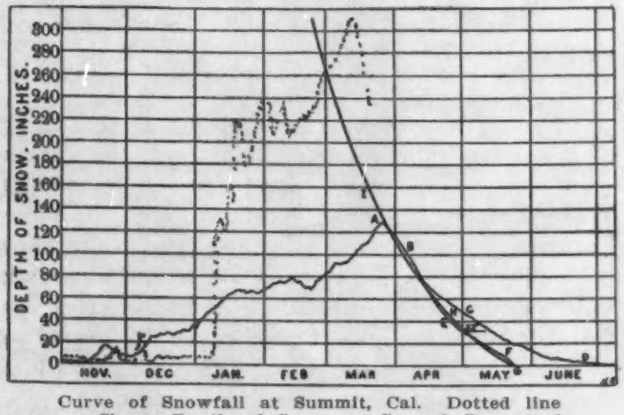
Total precipitation, including melted snow; ratio ten to one.

SUMMIT, PLACER CO., CAL. (Elevation, 7,017 feet.)

	J	A	S	O	N	D	J	F	M	A	M	J	Inches
1878	.....	.....	.....	.....	.....	.....	100.0	115.0	30.0	24.0	16.0	.....	.....
1878-79	.....	.....	4.2	12.1	8.0	6.0	77.5	57.0	209.0	45.2	25.5	1.0	445.5
1879-80	.....	T	0	42.0	56.0	133.0	66.0	75.0	89.0	298.0	24.0	.....	783.0
1880-81	.....	.....	.....	.....	5.0	62.0	45.0	16.0	15.0	10.0	0.5	.....	153.5
1881-82	.....	.....	6.0	26.0	30.5	43.0	65.5	90.0	193.0	32.5	6.0	.....	492.5
1882-83	.....	.....	7.5	27.5	39.5	49.5	10.0	26.0	72.0	34.0	33.0	.....	299.0
1883-84	.....	.....	.....	9.5	12.0	32.0	76.0	127.0	91.0	126.0	2.0	6.0	481.5
1884-85	.....	.....	11.0	21.0	0	94.0	14.0	5.0	1.0	38.0	10.0	8.0	202.0
1885-86	.....	.....	.....	.....	136.0	30.0	131.0	14.0	78.0	64.0	9.5	.....	462.5
1886-87	.....	.....	.....	31.0	17.0	34.0	56.0	207.0	14.0	58.0	5.0	.....	422.0
1887-88	.....	.....	.....	T	15.0	116.0	92.0	7.0	80.5	21.0	4.0	9.5	345.0
1888-89	.....	.....	.....	.....	16.5	39.0	10.0	15.0	95.5	19.0	63.0	3.0	261.0
1889-90	.....	.....	.....	24.0	61.0	185.0	192.0	116.0	147.0	26.0	25.0	.....	776.0
1890-91	.....	.....	.....	.....	.....	74.0	15.0	138.0	51.0	46.0	11.0	.....	335.0
1891-92	.....	.....	.....	0.5	3.0	119.0	40.0	34.0	74.0	45.0	63.0	2.0	380.5
1892-93	.....	.....	.....	6.0	88.0	95.0	79.0	108.0	145.0	92.0	21.0	.....	634.0
1893-94	.....	.....	3.5	3.0	36.0	60.0	155.0	152.5	34.0	43.0	24.0	.....	511.0
1894-95	.....	.....	5.0	29.0	10.0	245.0	258.0	42.0	47.0	25.0	24.0	.....	685.0
1895-96	.....	.....	2.0	0	14.0	83.0	105.0	7.0	97.0	182.0	54.0	.....	544.0
1896-97	.....	.....	4.0	9.0	123.0	41.0	40.5	143.5	180.0	12.5	0	7.0	560.5
1897-98	.....	.....	0.5	25.0	26.5	42.0	40.0	30.0	52.0	8.0	29.0	9.0	262.0
1898-99	.....	.....	.....	34.0	25.0	36.0	127.0	52.0	157.5	17.5	32.0	.....	481.0
1899-00	.....	.....	.....	89.0	29.0	79.0	41.0	38.0	79.0	42.0	9.0	.....	406.0
1900-01	.....	.....	1.5	21.0	60.0	15.0	113.0	120.0	45.0	55.0	10.0	.....	440.5
1901-02	.....	.....	14.0	22.0	12.0	10.0	19.0	163.0	89.0	30.0	11.0	3.0	373.0
1902-03	.....	.....	.....	23.0	75.0	46.0	85.0	32.0	111.0	27.0	8.0	.....	407.0
1903-04	.....	.....	.....	1.0	22.0	8.0	42.0	172.0	148.0	39.0	2.0	.....	434.0
1904-05	.....	.....	3.0	14.0	12.0	66.0	50.0	64.0	107.0	23.0	34.0	2.0	375.0
1905-06	.....	.....	5.0	0	78.0	37.0	138.0	82.0	109.0	26.0	36.0	3.0	514.0
1906-07	.....	.....	.....	T	18.0	98.5	136.0	26.0	265.0	21.0	19.0	19.0	602.0
1907-08	.....	.....	T	3.0	4.0	101.0	35.0	45.0	102.0	12.0	37.0	1.0	340.0
1908-09	.....	.....	T	10.0	36.0	27.0	226.0	82.0	46.0	4.0	11.0	.....	442.0
1909-10	.....	.....	.....	9.0	59.0	83.0	86.0	51.0	42.0	8.0	4.0	.....	342.0
1910-11	.....	.....	.....	3.0	30.0	33.0	283.0	53.0	.....	.....	.....	.....	.....

Snowfall each month at Summit.

and dividing by 10, using zeros for such years as have bare ground. To get a more correct rate of melting however we find the average date at which there was a given depth; for example, the mean date at which all snow is off the ground at Summit is May 26th: the mean date at which it is 20 inches deep is May 10th. In this way Professor LeConte obtained the curve marked in the diagram ABEFG; and disregarding small irregularities, calls the smooth curve IHG the mean curve of melting.



Curve of Snowfall at Summit, Cal. Dotted line Shows Depth of Snow on Ground Season of 1910-11 to date.

The actual curve of melting for any year can be compared with the mean curve and if it falls below the mean there is every probability that the season will be an open one; i.e., that travel in the mountains will be possible at a much earlier date than where the curve of melting exceeds the mean.

During the present year the depth on the ground was much below the mean until about January 9th, when the amount was increased rapidly. Notwithstanding some losses the depth up to the 9th of March is so far in excess of the average that we cannot reasonably expect an open season, so far as travel is concerned. On the other hand the abundant supply of snow offers every reason for expecting a bountiful water supply during the long summer months. This of course is of significant value to engineers, farmers and stockman.

A public utilities commission for California is provided in three constitutional amendments which have passed the legislature and are to be submitted to the people's vote. They provide for the reorganization of the present railroad commission, increasing its membership from three to five, to be appointed by the Governor for six-year terms, and extending its power of control over all public utilities in private ownership, including commercial, interurban and street railways, canals, pipe lines, plants and equipments for the transportation or conveyance of passengers or express matter or freight, including crude oil. The new commission is to have jurisdiction over telegraph, telephone, heat, water, light and power companies and concerns that furnish storage or wharfage facilities, as well as common carriers. Every class of private corporations, individuals or associations which the legislature may put under the head of public utilities will be subject to the commission's control and regulation, and it will have the right to fix rates to be charged for commodities furnished or services rendered by public utilities. The powers respecting public utilities now vested in the governing bodies of cities and towns shall be retained by them unless a majority of the electors of a county, city or town vote to surrender such powers to the commission.

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Changes of advertising copy should reach this office *ten days in advance of date of issue.* New advertisements will be accepted up to noon of Monday dated Saturday of the same week. Where proof is to be returned for approval, Eastern advertisers should mail copy at least thirty days in advance of date of issue.

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FOUNDED 1887 AS THE
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Roosevelt on the Recall of the Judiciary

Two weeks ago this paper expressed its views against the action of the California Legislature in passing a bill providing for an amendment to the constitution giving to the people the right to the recall which shall include the judiciary. This bill has been held by the proponents of popular and progressive government as being in accordance with the principles on which it is founded. It is a pleasure to note the views of Col. Roosevelt the admitted leader of the progressive movement, in his speech at Phoenix, Ariz., given in the plaza of that city, in which he reiterated his belief in the recall for Arizona, but disapproved its extension to include the judiciary, for, as he says, "it tends to produce timid courts and judges who keep their ears to the ground."

The Mexican Revolution

It is difficult to determine from the reports of the daily press whether the revolution in Mexico is real war or opera-bouffe. The muck-raking magazines tell about "Barbarous Mexico," though the justice of the appellation is hotly contradicted by proponents of the federal government. It is easy to believe that the present condition is both barbarous and serious, barbarous in the degenerate use of soft-nosed bullets by both parties without provision for either doctors or hospital appliances, and serious in suspending mining operations. This affects the power plants and in fact every industry, as in the mining districts everything is dependent upon mine operation.

Fanatic warfare affords little prospect of protection for American financial and engineering interests and it is to be hoped that Uncle Sam's moral influence, at least, will have its effect in terminating not only the reported barbarities, but the baneful interference with business.

Water Power Location

Every year, especially in the spring, there is a crop of new water right locations on most of the streams which have power possibility. These locations are sometimes made by people who really know the responsibilities and difficulties to be encountered in establishing an hydroelectric system, but by far the greater number see the fancied pot of gold at the end of the rainbow consisting of a little work, a lot of big talk and a water location.

Many of these locations contemplate the use of far more water than the stream can supply, except at flood periods, and often such a location is made where former rights would have precedence or where the low water flow is already used by existing plants. Oftentimes a market already well supplied is shown as the possible source of income, with the intimation that some competition would be necessary. This has been the weak point in financing these power schemes, even

where, upon examination, it is shown that the power was really available. For the financier likes not the idea of heavy competition in a limited field and a long wait for dividends.

There are undoubtedly many good so-called power sites whose development has not been considered by the most inexperienced dreamer, because their isolation and distance from any visible market has precluded a foresight of their possibilities. These, however, will be the great plants of the future. Each year new markets for this power are created and locations which in the previous year seemed visionary are taken up and profitably developed.

P. A. Y. E. Cars

The first pay-as-you-enter cars were placed in service in San Francisco this week. It is yet too soon to pass judgment on the successful outcome of this venture by the United Railroads. A service of this kind must be governed more or less by the local conditions surrounding the operation and in San Francisco these conditions are perhaps more severe than in any other city. This is true both on account of the length of runs, the many and severe grades, the abnormally heavy traffic, a habit of overcrowding and a public antagonism which has been engendered by a service woefully lacking in equipment and power. With the advent of the new cars the latter condition will be undoubtedly relieved and an entire new power equipment, ample in all respects, has been installed.

It is a curious fact that some proposed expedients are frowned upon by intelligent people who can give many arguments and reasons why they should fail, but which, when tried, disprove the popular prediction and are eminently successful. This has been specifically the case with the pay-as-you-enter service. This service is now in use in many cities with most gratifying success. The same adverse opinions are heard in San Francisco, but there is no proof that the favorable results of other cities may not be duplicated here. It is to be hoped that the public will take kindly to this new service and meet the railway half way in its attempt to better conditions.

Municipal Street Railways

In this day when public service corporations are indiscriminately accused of all sorts of graft and crookedness, their officials held up to public scorn on the slightest pretext and legitimate business constantly menaced through careless public opinion, municipal ownership and control of public utilities is a fetish in the popular mind, a panacea for all ills. Of course there is some foundation for what now seems unreasonable prejudice, because a decade or more ago these same companies were not always operated with that consideration for the people's rights which is almost universal today. The most radical may argue that a wrong-doer who goes unpunished, but who is caught many years later, is just as liable to punishment. But such sentimentalism in valuing stocks and bonds is the height of absurdity.

The sale of the municipal bonds for San Francisco's Geary street railroad is interesting to financial institutions and to the economist. The first offer of $600,000 in these bonds found no bidders; the second offer has brought out a few subscribers, some savings banks, but mostly individuals, whose total subscription is only $93,000. San Francisco bonds have, as a rule, been sold at a premium and in many cases entire issues have been underwritten by one or more of the great bond houses. As a reason for this showing public opinion conjures up an insidious influence over the great bond houses by the public service corporations. It is argued that a new and baneful precedent will be established to interfere with their business. On the other hand the companies argue that records show that municipally operated street railroads are usually a failure in America. In this case the establishing of a municipal utility likely to fail should be of the greatest interest to the existing company.

The reason is undoubtedly more far reaching and must be traced to the individual reticence of the bond subscriber in placing his money where it will be handled by the public conscience for the good of the community rather than by the private specialist who is after the greatest results for all concerned.

Electricity in Agriculture

Agriculture, though our greatest industry, is that most neglected by the central station. High tension transmission lines crossing the richest farm lands on their way from water-fall to city hall are like limited trains giving no intermediate accommodation to the farmer. His most pressing needs for the operation of stationary machinery have been ably supplied by the gas engine, even to the point of driving the generator for electric lighting. But his main reliance for power in the field has always been on the horse, which may truly be said to have gone "back to the farm." Even this last refuge has been invaded by the engine or motor, which tires not, neither does it eat off its head while idle. Deep ploughing especially is necessary to increase the yield per acre. A six or seven inch furrow is as deep as can be ploughed by a team of horses, while the requisite depth of twelve to fourteen inches can be practically obtained only by mechanical plows. For tillage and harvesting also the horse is inadequate and inefficient, costing about eight cents per horsepower hour and usually scrapped after ten years' useful service.

In America the gas and steam engine has been most widely adopted as a mechanical substitute for the horse, but in Germany and France the electric motor has proved superior in economy, flexibility and simplicity. Here, then, is a fallow field for the central station.

PERSONALS.

L. H. Bean, superintendent of the street railway system in Tacoma, is at San Francisco.

J. M. Hunt, of Hunt, Mirk & Co., has been spending a few days in the Santa Cruz mountains.

V. M. Steadman, secretary of the National Electrical Works of Los Angeles, recently visited San Francisco.

A. L. Snyder, chief engineer of the Seattle Electric Company of Seattle, Wash., was a recent San Francisco visitor.

Kempster B. Miller, of McMeen & Miller, electrical engineers, is at Los Angeles on telephone engineering business.

A. M. Hunt is making an engineering examination in Amador County, in connection with a possible power development.

William Hoopes, the electrical engineer, with the Aluminum Company of America, is at Los Angeles en route to the East.

Don C. Ray has been made manager of the Contra Costa district of the Pacific Gas & Electric Company, vice Joseph Mayo, resigned.

G. W. Manley, who is connectetd with the Crescent City Water, Light & Power Company, has returned to Crescent City from San Francisco.

A. D. Fischer, president of the Schutte & Koerting Co., of Philadelphia, has returned East after an extensive trip throughout the Pacific Coast.

W. S. Iliff of Denver, who is associated with the management of the United States Light & Traction Company, recently visited San Francisco.

H. M. Cooper has been appointed manager of the newly-created Placer district of the Pacific Gas & Electric Company, with headquarters at Auburn, Cal.

Bion J. Arnold, who has a national reputation as a consulting electrical engineer in connection with electric traction problems, is at San Francisco.

F. Boardman Clapp, Jr., has arrived from the East and joined the electrical engineering staff of the General Electric Company's San Francisco office.

Geo. R. Murphy of Pierson, Roeding & Co., has recovered from a severe attack of pneumonia of ten weeks' duration and is again at his San Francisco office.

H. C. Goldrick, Pacific Coast manager for the Kellogg Switchboard & Supply Company of Chicago, returned to his San Francisco office this week from Los Angeles.

H. W. Jackson, assistant general manager of the Sierra & San Francisco Power Company, visited the Stanislaus power station near Vallecito during the past week.

L. N. Peart, general superintendent of the San Joaquin Light & Power Company, recently spent a few days at San Francisco, making his headquarters with J. G. White & Co.

F. Seerberger, an electrical engineer, passed through San Francisco from the Orient last week, en route to Germany to interest capitalists in an enterprise which he has in plan at Tokio.

F. J. Southerland, formerly with the electrical distribution department of the San Francisco Gas & Electric Company, has been made manager of the newly-created Antioch district of the Pacific Gas & Electric Company.

S. D. Richmond, president of the Richmond Machinery Company of Salt Lake City, was at San Francisco this week and placed a contract for a large Pelton water wheel for a hydroelectric installation in the State of Utah.

G. H. Hill, assistant engineer of the General Electric Company's railway and traction department, has arrived from Schenectady and is paying a visit to the company's San Francisco offices. He is accompanied by M. M. Corbin, who is also an assistant engineer in the railway and traction department.

F. H. Varney, engineer of operation and maintenance of the Pacific Gas & Electric Company's steam engineering department, returned to San Francisco last Tuesday after making an extensive Eastern tour. He visited the principal electrical power plants and factories in the East with a view to the installation of new steam turbines and a steam heating system at San Francisco.

Newly elected associate members of the American Institute of Electrical Engineers include E. M. Baldwin, electrician Noble Electric Steel Co., Hercult, Cal.; H. J. Briggs, operator Pacific Light & Power Co., Los Angeles, Cal.; Alfred Cook, switchboard operator Washington Water Power Co., Rearden, Wash.; H. B. Bishop, electrician Stone & Webster, Sumner, Wash.; W. P. L'Hommedieu, salesman Westinghouse Electric & Manufacturing Co., San Francisco; A. W. Lindgren, superintendent Huntington Beach Co., Huntington Beach, Cal.; F. H. Mayer, draughtsman Southern California Edison Co., Los Angeles, Cal.; J. D. Morton, local manager Idaho-Washington Light & Power Co., Pullman, Wash.; E. R. Nigh, assistant electrical engineer, Seattle Electric Co., Seattle, Wash.; Albert Stafford, Bay Cities Home Telephone Co., San Francisco; E. A. Wilcox, assistant superintendent Great Shoshone & Twin Falls Water Power Co., Twin Falls, Idaho.

TRADE NOTES.

Clarence E. Delafield has been appointed district manager for Crocker, Wheeler & Co., at Boston, Mass., vice R. N. Barnes, resigned.

B. C. Holst, district manager for the Northern Electric & Mfg. Co., Ltd., at Vancouver, B. C., announces their removal on March 1st, to the six story warehouse at 313 Water street.

The Southern Pacific ferry steamer "Piedmont" on San Francisco Bay, has been equipped with three hundred 40-watt tantalum lamps and E-5 Holophane shades by the General Electric Company.

The Compressed Air Machinery Company, 39 Stevenson street, San Francisco, have been apointed selling agents for the Peerless Rubber Mfg. Company of New York, manufacturers of packings, hose and belting.

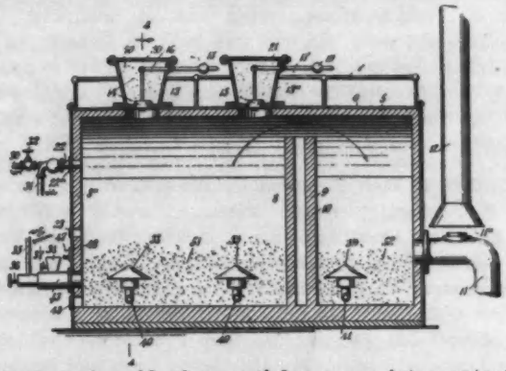
The Kellogg Switchboard & Supply Co., has closed a contract with the San Gabriel Valley Telephone Company for an extension of their plant, which covers the entire San Gabriel Valley with headquarters at Alhambra.

The National India Rubber Company of Bristol, R. I., announce that they have made a change in their agency arrangement for the Pacific Coast and in future a complete line of their rubber covered lamp cords, wires and cables will be carried at their branch office, 155 New Montgomery street, San Francisco, in charge of Otis & Squires.

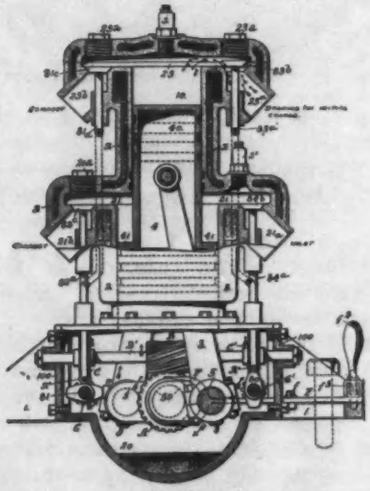
The firm of McMeen & Miller, during the past four years, has been engaged upon a specific design, construction and development of independent telephone properties in San Francisco and neighboring California cities. This work has been conducted by Mr. S. G. McMeen, member of the firm. He has devoted almost his entire time to it, largely to the exclusion of attention, on his part, to the service of other of their clients. Their work on those properties is finished. On April 1, 1911, Mr. McMeen will re-engage in general practice for their clients wherever located. As heretofore, they will practice general electrical engineering with special attention to telephony, continuing to serve municipalities and governing bodies generally in making appraisements and other investigations of public service.

PATENTS

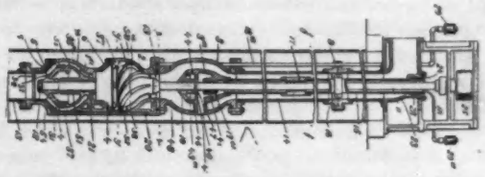
986,495. Process of Making Gas. Joshua John Nix, Alhambra, Cal. The method herein described, of making a combustible gas, which consists in reducing carbonaceous fuel to gaseous form, providing a supply of powdered carbon, drawing the same by aid of a partial vacuum into contact with said carbonaceous fuel in said gaseous form, and supplying steam to the mixture of said powdered carbon and said carbonaceous material in gaseous form.



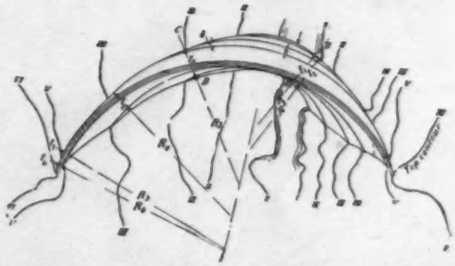
986,552. Internal-Combustion Engine. Nelson Edward Davies, San Francisco, Cal. In an explosive engine, the combination with a working cylinder and piston, the crank shaft connected with the piston, an oil holding casing that incloses the crank shaft, and the intake and exhaust valves for the working cylinder, each of said valves having a pendent member that extends into the crank chamber; of independent shafts in the casing, each having cams for co-operating with the said pendent members at their respective sides, another shaft in the casing geared with both cam carrying shafts, and direct gear connections that connect the said other shaft with the crank shaft, and shifting clutch mechanism on the crank shaft, operable from outside the casing for bringing said gear connections into and out of operative connection with said crank shaft.



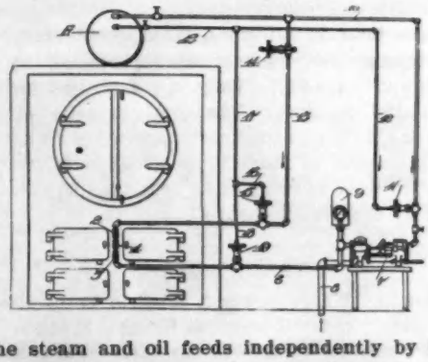
986,827. Centrifugal Pump. Franklin H. Jackson, West Berkeley, Cal., assignor to Byron Jackson Iron Works, West Berkeley, Cal. In an apparatus of the character described, a series of superposed shells or casings, said shells being of spheroidal form having inner and outer walls with a spheroidal space therebetween, said space being open at both ends, curved guide vanes in said spheroidal space, the upper one of said openings having a radially outwardly projecting flange, concentric upwardly extending pipes forming a discharge pasage between them above the uppermost shell, a revoluble shaft journaled axially within the inner pipe, and extending through the shells, upwardly divergent conical runners fixed to the shaft having their larger portions revoluble in the lower portions of the shells, said runners having annular channels between their outer and inner portions with curved arms within the channels, through which channels the liquid is lifted by a combined propelling and centrifugal force, the liquid being delivered successively from the runner through each shell and thence through a succeeding runner and pressure retaining ribs fixed exteriorly of the runner.



986 718. Dam Construction. Lars Jorgensen, Berkeley, Cal., assignor of one-half to Frank G. Baum, San Francisco, Cal. An arch dam comprising superposed arch shaped elements of varying radii and thickness, the radii and thickness of such elements varying with the widths of the canyon at the corresponding levels of such elements and bearing a definite relation to such widths and to the pressure to which they are subjected.



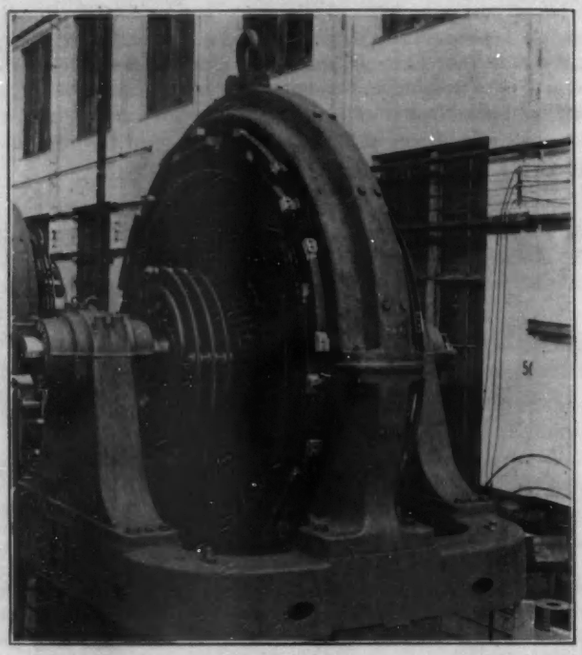
986,791. Liquid-Fuel Governor. George E. Witt, San Francisco, Cal. An oil-burning system having in combination a boiler, an oil pump, a burner having a steam pipe connected with the boiler and also having an oil pipe connected with the pump, governors in the oil and steam pipes controlled by the variations of steam pressure in the boiler, said governors regulating the steam and oil feeds independently by the boiler pressure, and means for operating the oil pump, a governor regulating the oil pump adapted to respond to a decrease of boiler pressure and to admit an increased feed of steam to the oil pump, for causing an accelerated boost to the oil pump to cause it to raise the oil pressure in the oil pipe.



INDUSTRIAL

NEW LINE OF WESTINGHOUSE ROTARY CONVERTERS.

The limitations of economic transmission of direct current necessitate either close proximity of the generator and the point of power application, or introduction of alternating current for generation and transmission. Today the two distinct systems for electrical distribution are often combined to great advantage by means of apparatus for transforming alternating into direct current. For such service the Westinghouse Electric & Manufacturing Company, has, during the past few years. developed a complete line of rotary converters. The Westinghouse rotaries of the new standard line are all self-starting.



New Type of Westinghouse Converter.

The combined efficiency of a rotary converter and transformers will usually be somewhat higher at all loads than the efficiency of a motor-generator set of equal capacity and voltage. Practically all large systems requiring change from alternating to direct current for railway or power service have adopted conversion by rotaries on account of their simplicity and compactness.

They are built in all sizes, from small machines used in the laboratory for demonstration purposes, up to units of 3000 kilowatt capacity. They are arranged for standard frequencies and voltages. The total capacity of Westinghouse rotaries now in satisfactory operation in all parts of the world amounts to more than 1,000,000 kilowatts. The new line of rotaries is completely described in Circular 1028, just issued by the Westinghouse Company.

TRADE NOTES.

The Portland Water Power & Electric Transmission Company has recently ordered from the General Electric Company, a complete electrical equipment for their new power station on the Clackamas River at River Mill Station, near Estacada, Oregon. Three 3300 kw. .9 P. F.-60-cycle, 3-phase, 11000 volt generators will be direct connected to three 600 h.p. hydraulic turbines, operating at 240 r.p.m., each generator being excited from a 60 kw. direct connected exciter. An additional exciter unit, consisting of a hydraulic turbine driven set of 85 kw. capacity, is provided as a reserve in case of accident to the direct driven units. Each alternator will be connected to a 3-phase step-up transformer of the same capacity as the alternator through disconnecting and oil switches. Each transformer will feed into the bus bars or directly into the transmission line through oil and disconnecting switches at normally 57,100 volts "Y" for transmission of the power developed to Portland, Oregon. A complete switchboard with lightning arrester equipment is also included in the order.

The Geo. E. Dow Pumping Engine Co., of San Francisco, report the following recent sales: Plumas Amalgamated Mines Co., San Francisco, one 12x20x12 horizontal Simplex steam driven air compressor, capacity 500 cubic ft. against 15 lb. pressure; National Ice & Cold Storage Co., San Francisco, one 6 & 10x8½x10 horizontal compound duplex piston pump; Associated Supply Co., San Francisco, one 14x7x12 Underwriters fire pump, 500 gal.; Cia de Aguas de Santa Ana, Santa Ana, Salvador, C. A., two 11x12 in. horizontal duplex piston pumps, direct connected to two 40 h.p. motors; D. D. Demarest & Co., San Francisco, one 13x14x18 horizontal duplex air compressor, capacity 700 cu. ft., against 100 lb. pressure; Union Hollywood Water Co., Los Angeles, one 12 & 22x 12 & 20x18 horizontal two-stage air compressor, cross compound, capacity 650 cu. ft. against 100 lb. pressure; California Oilfields, Ltd., San Francisco, one complete fuel oil burning set, one 500 sq. ft. suction surface condenser, one 6½x9x10 horizontal air pump, two 140 h.p. Parker water tube boilers, 150 lb. working pressure, one 12 & 22x10 & 18½x10 two-stage cross compound steam driven air compressor with Meyer cut-off engine, capacity 650 cu. ft. against 100 lb. pressure; one 16x24x5½x18 horizontal compound duplex d.p. crank and fly wheel pump and two 5¼x3½x5 boiler feed pumps.

The White River plant of the Pacific Coast Power Company at Sumner, Washington, under the direction of Stone & Webster, is being equipped with two high head Francis turbines of 18,000 h.p., under normal head of 440 feet, with a guarantee of 20,400 h.p. under a 480 foot head, supplied by the Allis-Chalmers Company. These units are direct connected to two 10,000 kw. 360 r.p.m. General Electric alternators. The plant has been designed for an ultimate capacity of six such units. The turbines are of a double discharge Francis type with a spiral case and equipped with Allis-Chalmers latest type oil pressure governors, there being two pressure regulators for each unit, each capable of discharging 100 per cent of the capacity of the turbine, one being operated directly from the pipe line pressure and the other from the gate of the turbine, so as to be used either as a water saving device or as a synchronous bypass. Both regulators are connected with the bottom of a cast steel spiral casing by a Y pipe whose mechanism is connected to a break plate bursting at 60 per cent pressure above normal. Each turbine is fed by a separate steel pipe line and the supply can be shut off entirely by means of 7 ft. butterfly valves. These valves are the largest of this type ever designed and are arranged for both electric and hand operation. All parts under pressure are to be tested to a pressure corresponding to 880 foot head (385 lbs.) resulting in a pressure on the butterfly valves of 2.200,000 lbs. The shaft of the turbine has a 16 in. diameter in the bearings and is 22 feet from bearing center to bearing center. The exciters are driven by Allis-Chalmers impulse over-hung wheels with an adjustable needle governor and regulator. These units are expected on the ground early in June, 1911, and it is hoped that the plant will be delivering power to Seattle this fall.

NEWS NOTES

INCORPORATIONS.

LOS ANGELES, CAL.—The Gas Securities Company has been incorporated by F. R. Bain, C. S. S. Forney, and R. B. Wheeler, with a capital stock of $30,000.

RED BLUFF, CAL.—The Gerber Water & Light Company has been incorporated with its principal place of business at Sacramento. It plans to construct water and light plants for the proposed town of Gerber, nine miles south of Red Bluff. The capital stock is $50,000. Edward H. Gerber, F. W. Kiesel and George W. Peltier are the directors.

ILLUMINATION.

EVERETT, WASH.—The Everett Railway, Light & Power Company will install a system of cluster lights on Wetmore avenue.

ESCONDIDO, CAL.—The Escondido Utilities Company will install a complete new system of lighting and all lamps will be on the same circuit.

YUMA, ARIZ.—A franchise permitting the sale of electric light and power has been applied for by H. W. Blaisdell and will be submitted by the City Council to a vote of electors.

SAN FRANCISCO, CAL.—The Municipal Light & Power Company has reduced the minimum price for electric power to 2½ cents per kw. as compared with the 3-cent rate of the San Francisco Gas & Electric Company.

REDDING, CAL.—The Board of Supervisors has granted a franchise to the Siskiyou Electric Light & Power Company, of Yreka, authorizing that corporation under the customary restrictions, to erect poles and lines on the public highway in Shasta County, outside of incorporated towns.

BAKER, ORE.—The city engineer has been instructed to prepare estimates for the installation of a city lighting plant. The plans propose the construction of a pipe line from Ely Creek to Salmon Creek to replace an old flume. The construction of a new reservoir of 3,000,000 gallons capacity is also proposed in the plans.

MORGAN HILL, CAL.—The Board of Trustees has passed an ordinance granting to the Coast Counties Light & Power Company, the right to erect, maintain and operate along and across the highway of the town of Morgan Hill, poles from which to suspend wires and other appliances for transmitting electric current in the town of Morgan Hill.

VANCOUVER, WASH.—The City Council has granted to the Oregon-Washington Corporation recently formed to take over the gas, water and traction systems, three 50-year franchises for those utilities and to the Mount Hood, Light & Power Company, supplying the city with electric light and power, a 50-year franchise. The Oregon-Washington Corporation agrees to spend $500,000 in improvements in the near future. A gravity water system will offer fire protection and the city will install 100 new hydrants.

YREKA, CAL.—Construction of a dam at the head of Ward's Canyon, 16 miles above Hornbrook, on the Klamath River, has been commenced by the Siskiyou Electric Light & Power Company. The dam will be 250 feet long and 90 feet high, and when completed will furnish sufficient water for the development of 20,000 h.p. of electricity. The company has patent rights sufficient for the development of 30,000 h.p. Work will soon be commenced on power lines to Klamath Falls and to Butte Creek Valley. It is expected to complete the work this summer.

REDDING, CAL.—The Supervisors, on application of the Siskiyou Electric Light & Power Company, have passed a resolution to advertise for sale a franchise to erect power and light lines on the highways of Shasta County. The franchise will be ordered for sale May 8. The franchise was asked by J. W. Churchill and Alex Posborough, capitalists of Yreka, who are heavily interested in the Siskiyou Electric Light & Power Company. The company is one of the large power companies of California, with offices in Yreka and furnishes light and power in Oregon north of Ashland and in Siskiyou County as far south as Dunsmuir, which is near the Shasta County line.

TRANSMISSION.

KENNETT, CAL.—The power lines of the Sacramento Valley Power Company will be extended into Kennett within the next few months.

MELROSE, CAL.—The Coast Mfg. & Supply Company has contracted with the Great Western Power Company for 150 h.p., and will shut down their steam plant.

SAN BERNARDINO, CAL.—A formal proposition of the Lytle Creek Power Company for the sale of its power plant and distributing system to the city has been made.

CHICO, CAL.—It is reported that J. L. Gillenwater has sold his water rights on Deer Creek to the Sacramento Valley Power Company with which the Fleishhackers recently became affiliated and that they propose to install power equipment.

CANANEA, MEX.—The Sunset Development Company, operating in Barranca district, developing coal land, is contemplating the installation of a power house which will be sufficient to supply electricity to all the companies operating in that district.

VALDEZ, ALASKA.—T. G. Quinn, superintendent of the Alaska Water, Light & Telephone Company, announces that improvements will be made to the local plant. A new and improved switchboard will be installed, numerous improvements to the light and power plant will be made increasing the voltage from 2300 as at present to 13,000.

SAN BERNARDINO, CAL.—For the purpose of supplying pumping power to settlers in the fertile Chuckawalla Valley on the eastern border of San Bernardino County, the Chuckawalla Development Company has been sounding the Colorado River bottom for the purpose of locating a power dam site. R. M. Teague, president of the company, is in active charge of the work.

SAN FRANCISCO, CAL.—The City Electric Company of San Francisco has been bought by the Great Western Power Company, of which Edwin Hawley is the head. The consideration is $4,000,000 or $80 a share for the 50,000 shares of the City Electric Company. The deposit of $150,000, which had been put up while negotiations were pending, has been paid to Herbert Fleishhacker, and the agreement of the sale and transfer of the shares signed.

SACRAMENTO, CAL.—John and Russell Fairbairn, have filed an action against the American River Electric Company to recover $175,000 damages for injuries sustained by them in an accident that occurred on the Middle Jackson road last June. They were moving a derrick when it struck one of the power lines, transmitting the electricity to the two boys.

John was so badly injured that he had to have his left arm amputated, while Russell had to have his left arm and right foot cut off. The former asks for $100,000 damages and his brother for $75,000. The accident, they claim was due to poor insulation.

TRANSPORTATION.

TURLOCK, CAL.—S. N. Griffith has applied for a 50-year franchise for an electric road through this city.

LOS ANGELES, CAL.—A petition signed by forty Vernon avenue property owners has been sent in to the City Council favoring a cross town car line on Vernon avenue from Fourth to south of Jefferson street.

FERNDALE, CAL.—Preliminary steps looking to the construction of an electric line to connect Ferndale and vicinity with other parts of the county have been taken, and the results obtained have been most satisfactory. D. A. Francis of Ferndale has been locating the route.

SANTA ROSA, CAL.—The Petaluma & Santa Rosa Railroad made its first move in regard to the proposed extension to McNear's Point by entering into a traffic agreement with the Western Pacific Railroad, whereby the electric is authorized to make through freight rates to and from eastern points.

ANTIOCH, CAL.—That the promoters of the Oakland Antioch Electric Railway intend building the line through to Stockton, and that at an early date, is demonstrated by the fact that their representatives are now at work between Antioch and the Slough City, securing rights of way for the road.

SAN FRANCISCO, CAL.—Sealed bids will be received by the Board of Public Works, at their office, tenth floor, David Hewes Building, 995 Market street, between 2 and 3 p. m., April 5th, 1911, for furnishing and delivering to the city and county a quantity of tubular steel trolley poles for the Geary street municipal railway.

TUCSON, ARIZ.—With a visit of the officials of the Tucson Rapid Transit Company to this city, work on the proposed extension of the street car line from the university gate to Speedway and then down Speedway for about a mile, has been revived. Property owners along Speedway who are backing the project now feel sure that they will succeed in their efforts.

OREGON CITY, ORE.—The Mt. Hood Electric Railway Company is preparing to enter Oregon City and at a meeting of the City Council, application was made for a franchise to furnish heat. The company's representative was accompanied by G. O. Fields, who has been promoting the construction of an electric railway from Oregon City through the Molalla Valley to Silverton.

OAKLAND, CAL.—The City Council favors a 50-year franchise to be given to the Southern Pacific Company from the Sixteenth street depot to the mole for the proposed elimination of what is known as "death curve." The question of a subway or overhead crossing at Seventh street, where the company will maintain four tracks, has been discussed, but no action taken. The railroad company has offered to pay one-half of the cost in either event.

OAKLAND, CAL.—The Oakland Traction Company is planning to inaugurate a new service on the Hayward lines within a short time. The Hayward cars, instead of stopping at Clay and Twelfth streets in Oakland, as now, will proceed down Twelfth street and out Poplar street to Poplar Junction, taking the place of the regular Key Route cars, which have caused congestion on Twelfth street at Broadway. The Hayward cars will be equipped with trailers, to handle the increased San Francisco travel. Upon the assurance of President E. A. Heron, given through Stuart S. Hawley, that with the relieving of the congestion on the East Fourteenth street lines in East Oakland, Fruitvale and Melrose, the company would put on an express service to Hayward, the combined organizations of the Hayward Chamber of Commerce and the Hayward Real Estate Exchange adopted resolutions last night petitioning the Oakland City Council to grant the Oakland Traction Company its desired franchise on East Sixteenth street, known as the old county road, between Thirteenth avenue and High street.

TELEPHONE AND TELEGRAPH.

NOME, ALASKA.—Fire recently destroyed the telephone exchange.

UKIAH, CAL.—H. Olsen has been granted a franchise for a telephone system in First Read District, Mendocino County.

NAPA, CAL.—John A. Carbone has applied for a fifty-year franchise for a telephone system to be erected in Napa County.

MERCED, CAL.—Arthur L. Bruce filed an application for permission to erect a public telephone line in Supervisor District No. 4.

BISHOP, CAL.—G. A. Hanson, who had presented a bid for telephone franchises has been granted permission to withdraw same on his request.

LIVINGSTON, CAL.—E. D. Thomas, president of the Livingston Realty Company, is arranging plans and purchasing material for Livingston's telephone system, of which Mr. Thomas is projector.

OROFINO, IDAHO.—Sampson Snider, manager of the Clearwater Telephone Company, announces that he will immediately begin the construction of a telephone line to serve the Elk river district.

McMINNVILLE, ORE.—The McMinnville Mutual Telephone Association has asked for a 25-year franchise for the purpose of installing a local telephone system. This will also be connected with long distance telephones.

BUTTE FALLS, ORE.—The office of the United States Forest Service has forwarded recommendations to the district forester for the installation of a telephone line from this place through the Prospect country, to cost approximately $2200.

ELKO, NEV.—F. H. Winter, A. Z. McCloy, C. S. Andrews and E. C. Murray, all of Jarbridge, Elko County, Nevada, have made application to the Board of County Commissioners for a franchise to install a telephone line and operate the same for 25 years from Jarbridge to Deeth.

PALOUSE, WASH.—The Interstate Consolidated Telephone Company will erect a building here and establish a modern phone service in this vicinity this summer. It is understood that the company will string wires to the principal cities and towns in the Palouse district.

SAN FRANCISCO, CAL.—A meeting of the telephone rates committee of the Supervisors was held last week. A delegation of hotel men, headed by Kirk Harris, was present to present their contention of last year that the charge of 25 cents per month being paid by the hotel men for room telephones should be eliminated.

SAN FRANCISCO, CAL.—The officials of the Pacific Telephone & Telegraph Company request that they be allowed to abolish the present four-party residence line, with 30 free switches at $1.50 a month, and substitute a two-party line with 60 free switches at $2.25 per month, maintaining that a better service can be given on a two-party line.